April 1981
vol 7, no 4
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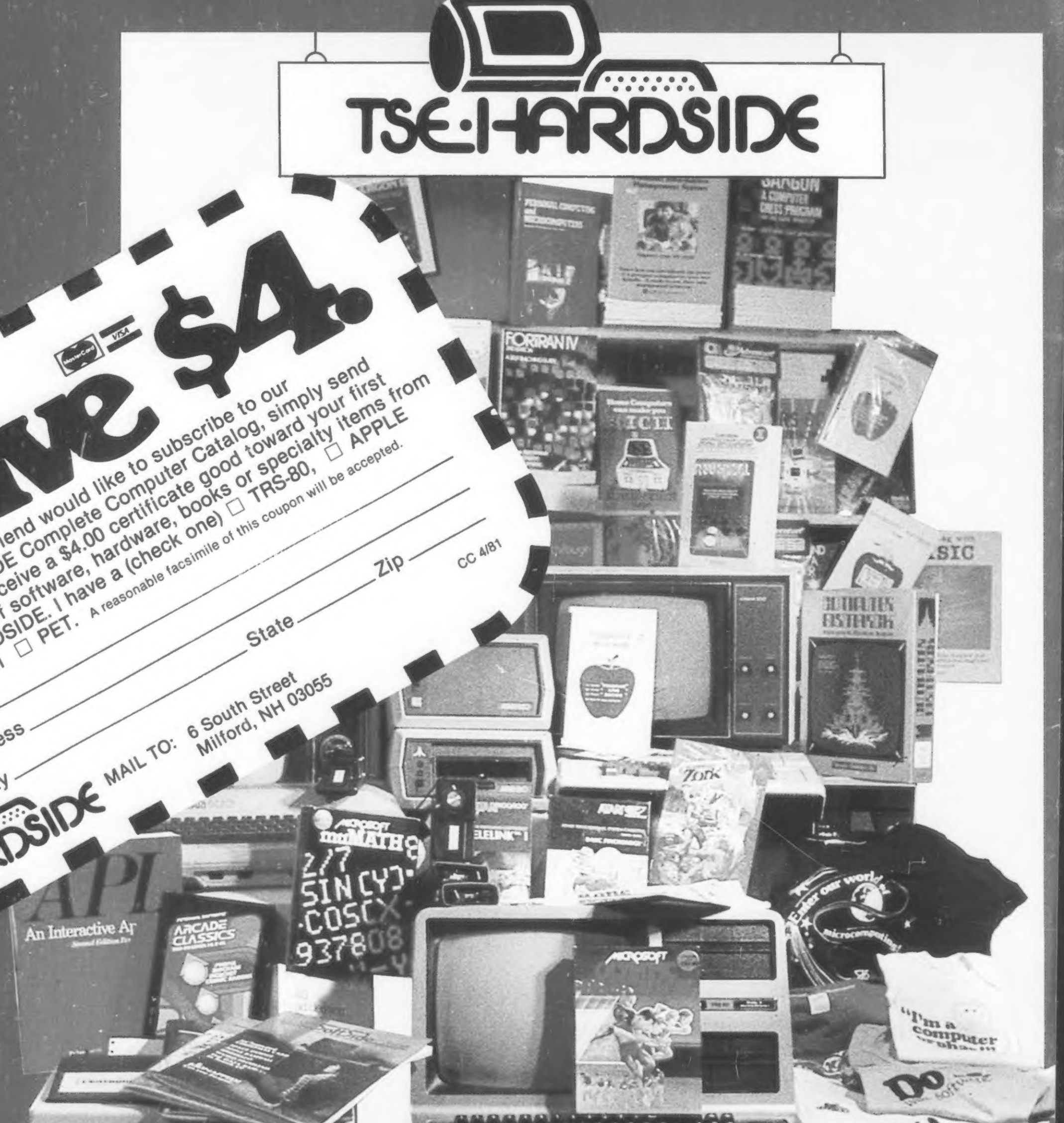
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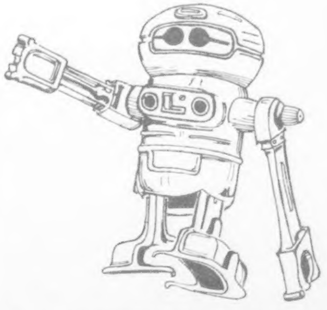

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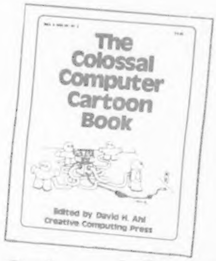

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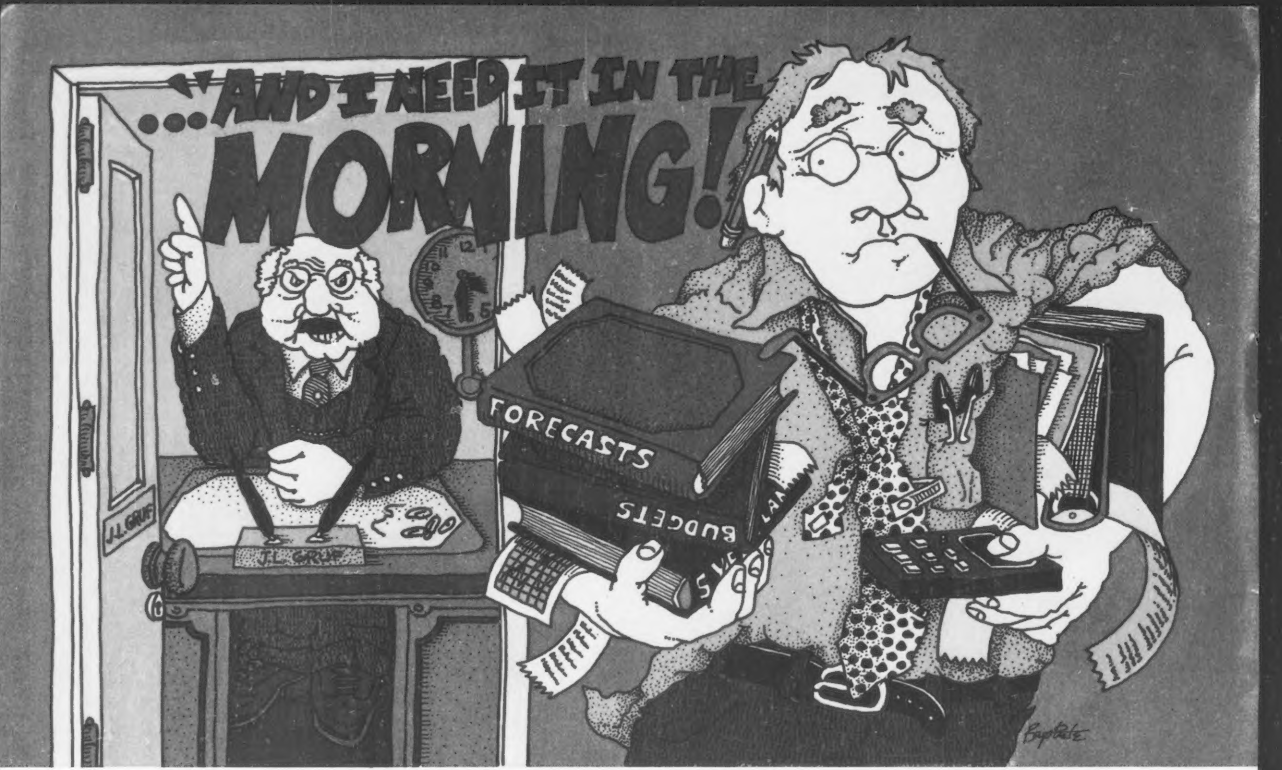

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APRIL 1981 **VOLUME 7, NUMBER 4**

Creative Computing magazine is published monthly by Creative Computing, P.O. Box 789-M, Morristown, NJ 07960. (Editorial office 39 East Hanover Ave., Morris Plains, NJ 07950 Phone: (201) 540-0445.)

Domestic Subscriptions: 12 issues $20; 24 issues $37; 36 issues $53. Send subscription orders or change of address (P.O. Form 3575) to Creative Computing P.O. Box 789-M, Morristown, NJ 07960. Call 800-631-8112 toll-free (in New Jersey call 201-540-0445) to order a subscription (to be charged only to a bank card).

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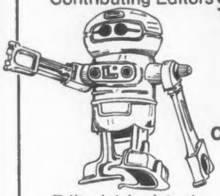

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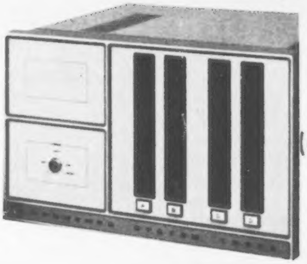

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Creative Computing Game Programmer Award

Creative Computing has introduced a special award for outstanding creativity in game programming for small computers. The 1980 winner of the Creative Computing Award will be announced at the West Coast Computer Faire in San Francisco on April 3 and 4, 1981.

The award will recognize the programmer of a computer game selected for originality of approach, creativity, and "flow." Flow is the quality of some activities to absorb people completely, causing them to forget such activities as eating, sleeping, and the passage of time. Good computer games are notorious in this respect, and it is not unusual at the home office of Creative Computing in Morris Plains, New Jersey to see employees playing games on the computers long after working hours.

The editoral staff of *Creative Computing* has been seeking nominations from their regular review staff. Final selection of the winning game is the responsibility of a committee consisting of David Ahl, George Blank, and Betsy Staples.

1981 National Computer Shows

Northeast Expositions, Inc. has announced five regional National Computer Shows for 1981.

In chronological order the shows are: The Southwest Computer Show, Thursday, April 9 through Sunday, April 12, at the Dallas Market Hall; the Second Annual Mid-West Computer Show, Thursday, September 10 through Sunday, September 13, at Chicago's McCormick Place; the Second Annual Mid-Atlantic Computer Show, Thursday, September 24 through Sunday, September 27, at Washington's D.C. Armory; the Third Annual Northeast Computer Show, Thursday, October 15 through Sunday, October 18, at Boston's Hynes Auditorium; the Southeast Computer Show, Thursday, October 29 through Sunday, November 1 at the Atlanta Civic center.

For more information contact: The National Computer Shows, 824 Boylston Street, Chestnut Hill, MA 02167. (617) 739-2000.

Apple Seed, A Computer Literacy Kit For Schools

Apple Computer Inc. has announced a computer literacy program—named Apple Seed—that promises to provide qualifying elementary and high schools in the U.S. and Canada with computer course materials.

Under the program, Apple Computer will provide a bonus kit of course materials, valued at approximately $500, to each school that qualifies as a "start-up" school and which buys a 32K Apple computer with disk drive. The offer runs through July 31, 1981. School districts expanding ongoing computer education programs with additional computers can also qualify to receive the free material, but the offer is limited to one set of Apple Seed materials per school.

The Apple Seed kit is designed to serve teachers as well as students. It contains computer literacy programs for teachers and students, including tutorial materials in Basic for classes with up to 25 students.

Course materials include: *Computers and Education* and *Microcomputer Systems and Apple Basic*, both by James S. Poirot; a "Computer Literacy Show and Tell Kit," developed by Dr. Poirot and the Sterling Swift Company; "Computer Discovery," a comprehensive computer literacy course; an "Applesoft Tutorial," by Apple Computer and *Educational Software Directory.*

M.I.T. Summer Session

The Massachusetts Institute of Technology has announced a special summer session program to be held at M.I.T. this August. Entitled **Media Technology**, the program will run in two parts. Part 1 deals with "The Human Interface with the Information Sciences," Part 2 with "Optical Videodiscs, Their Production and Application." The first part will run from August 10—14, the second from August 17—21.

For more information, contact: Director of the Summer Session, Room E19-356, M.I.T., Cambridge, MA 02139.

National TRS-80 Microcomputer Show

The First Annual National TRS-80 Microcomputer show will be held in New York City May 22nd, 23rd and 24th at the New York Statler Exposition Center (opposite Madison Square Garden and Pennsylvania Railroad Station). Featured at the show will be commercial exhibits of manufacturers, distributors, and retailers of TRS-80 related equipment for the Model I, Model II, Model III, Color and Pocket Computers. This is the first mirocomputer show ever held for the TRS-80 user.

Seminars and user groups will be held in conjunction with the show. In addition, some very famous names in the TRS-80 world will be speaking on topics of interest to Tandy computer owners, and potential owners. The show will be aimed at business users, educational users and personal users of the 5 Tandy products.

Show hours are Noon to 6 PM on Thursday, 11 AM to 6 PM on Friday and 10 AM to 4 PM on Saturday. Over 100 exihibitors are expected to be at this show.

This show is not sponsored or endorsed by Radio Shack or Tandy Corporation.

For additional information, write or call: Kenneth A. Gordon, President, Kengore Corporation, 3001 Route 27, Franklin Park, NJ 08823. (201) 297-6918.

Superman

In the December 1980 issue we published an article by Bill Dyck entitled "It's a Blurb—It's a Game—It's Superman!" It should have been noted that Superman and his associated elements are the exclusive property of DC Comics Inc. and we regret the oversight.

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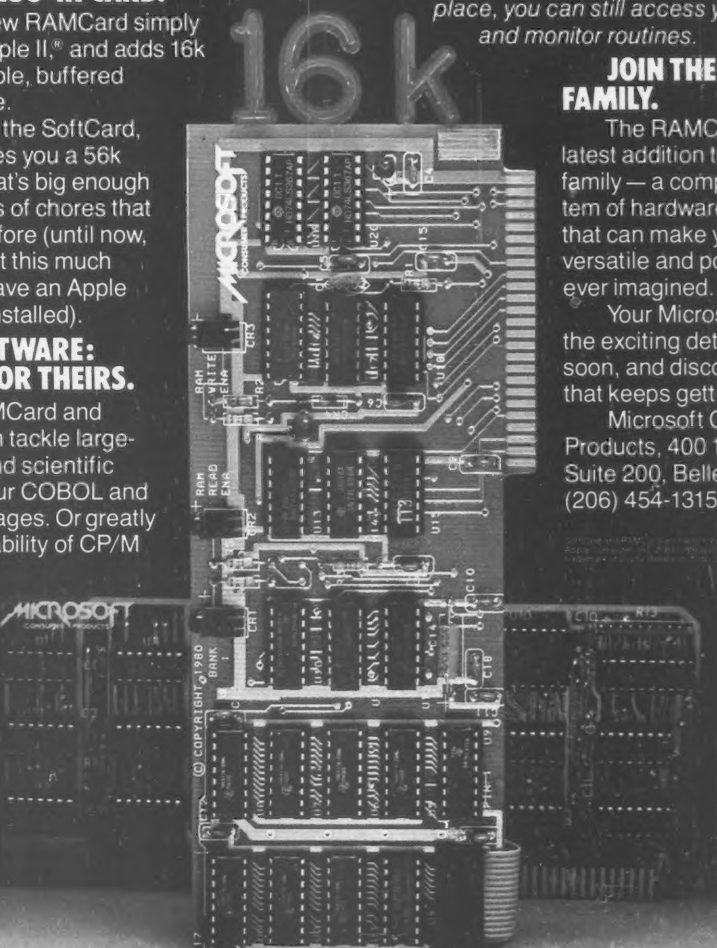

MICROSOFT

CIRCLE 168 ON READER SERVICE CARD

Input/Output

Color Coordinated

Dear Editor:

Being a recent purchaser of the TRS-80 Color Computer, I found James Garon's review in the January issue to be quite interesting and informative; in fact, it is the best of several that I have read recently. I believe that I have the explanation for the token "SUB" which Mr. Garon could not find in either manual—this is the SUB in GOSUB (note that "GO" is a separate token (number 129)). Similarly, the token "TO" is used in both GOTO and FOR...TO.

Here are a few other interesting things that I have found in my meanderings through the Color Computer: the "real" video addresses are from 1024 to 1535 (as opposed to the "ghosts" which appear starting at 9216 and 25600, which Mr. Garon found). The cursor address is stored at bytes 136 (MSB) and 137 (LSB).

In the area of printable characters, there is a difference between the results gotten by POKEing video memory and using the CHR$ function. When using POKE, the reverse video (lower case) characters occur from 0 to 63 (including numbers and punctuation); when using the CHR$ function, values 0 through 31 are non-printing control characters, 32—63 are punctuation and numerics, etc. (following the standard ASCII layout with lowercase characters occuring from 96—127—there are no reverse video numerics using the CHR$ function). Note that when using the ASC function, the CHR$ values are returned and that when one PEEKs at video memory, the "POKE" values are returned.

Thank you for publishing such an informative review—I will be sending in my subscription request soon so that I won't miss any future articles which you may have forthcoming on the Color Computer.

Alexander Frazer
764 N. W. 43rd Street
Fort Lauderdale, FL 33309

Sorcerer's Apprentice

Dear Editor:

First of all I would like to thank *Creative*'s readers for a rather overwhelming response to my two Sorcerer articles which appeared in the January 1981 issue. Secondly I would like to clarify a few points and pass on some valuable information I have received.

"Low-Resolution Graphics for the Sorcerer" requires corrections to the third and fourth sentences in the eighth paragraph. They should read:

"Since each character contains 64 dots, there are two to the 64th possible representations (clearly exceeding the Sorcerer's capabilities). If each character is instead viewed as containing four points which can be on or off, only two to the 4th (sixteen) graphics characters are necessary to account for all combinations of points."

In "The Sorcerer Meets the Paper Tiger" I neglected to mention how to call the screen printer routine from Basic. This is accomplished by the following statements:

```
POKE 260,86 :REM LOW ORDER BYTE OF DRIVER
ADDRESS
POKE 261,56 :REM HIGH ORDER BYTE OF DRIVER
ADDRESS
X=USR(0) :REM CALL SCREEN PRINT ROUTINE
```

Both Joseph Power and Earl Youngs of East Lansing, MI were kind enough to let me know how to protect machine language routines from being clobbered by the Basic interpreter. Basic's CLEAR command has an optional second parameter (undocumented) which informs the interpreter of the highest memory address it may use. Machine language routines can be safely loaded into memory addresses higher than the value specified. The command format is:

```
CLEAR a,b
```

where "a" is the number of bytes of string space to be reserved and "b" is the highest address (in decimal) that Basic can use. "b" cannot be greater than 32766. The CLEAR command should be the first statement in the program.

Bob Stuckmeyer
2347 Cavendish Lane
St. Louis, MO 63129

Hamming It Up

Dear Editor:

In your I/O column of Feb., 1981, David Williams expressed a need for a modem that would be switchable from ASCII to Baudot code, to be used in communications involving the deaf who have access to Baudot terminals. I would suggest another possible solution. It is to use one of the programs written for many popular microcomputers, for Amateur Radio operators who use both the ASCII and the Baudot codes over the air.

I have written such a program myself, for the Heath (or Zenith) H89 computer with H88-3 serial interface. It works with almost any modem having the RS-232 interface standard, and a simple RS-232/current-loop converted could be incorporated. It translates from ASCII to Baudot, and vice versa, at several selectable standard speeds.

Phillip L. Emerson
3707 Blanche
Cleveland Heights, OH 44118

Help

Dear Editor:

I need an 8K (or larger) Basic interpreter on Tarbell cassette suitable for use with an Imsai 8080. I also want the source code listing if at all available.

I live in Saudi Arabia where computer materials are unobtainable. Any help you could give would be much appreciated.

Thank you.

Richard Herman
c/o Donald Herman
Thor Johnson Dorm
Interlochen Arts Academy
Interlochen, MI 49643

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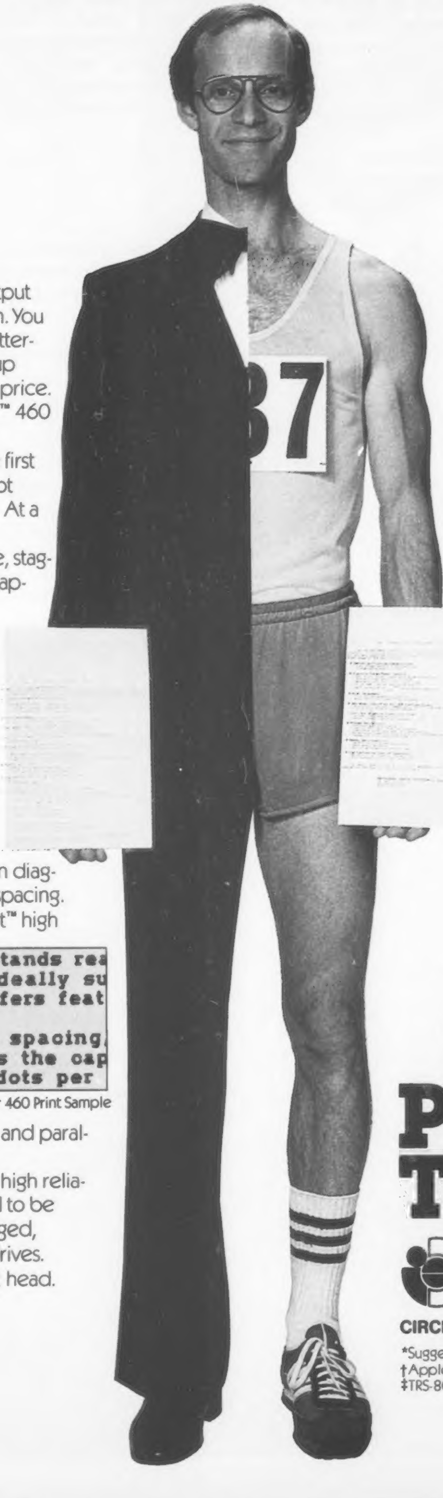

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I/O, continued...

34 Users

Dear Editor:

Now that the IBM System 34 has a Basic compiler, *Creative Computing*'s customer base has been widened.

I purchased Volume 1 and 2 of *The Best of Creative Computing* and found both to be very interesting. The program I found most interesting was Star Trek. I became so engrossed by the program that I rewrote it in IBM System 34 Basic. The program works perfectly. To the best of my knowledge, it is the only working Star Trek on the IBM System 34.

If any of you IBM System 34 readers have other games they would like to trade by swapping diskettes, I would appreciate their correspondence.

Karl Dittman
Data Processing Supervisor
Ozark Lead Company
Sweetwater, MO 63680

The Big Fix

Dear Editor:

In the November 1980 issue of *Creative Computing* there was a letter to the editor concering "Adventure" games. The person who wrote the letter was a Mr. Timothy Marino.

I can relate to Mr. Marino's concern over the lack of computer games for mainframes. When I saw his letter I thought it was really fantastic that you put a letter like that in your magazine. I was starting to think nobody else cared for games for the "large" computers.

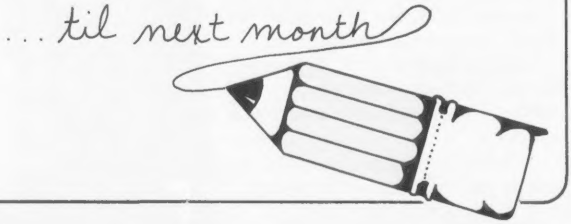
I have written Mr. Marino twice in two months as I have a copy of Original Adventure in both Fortran and PL/1.

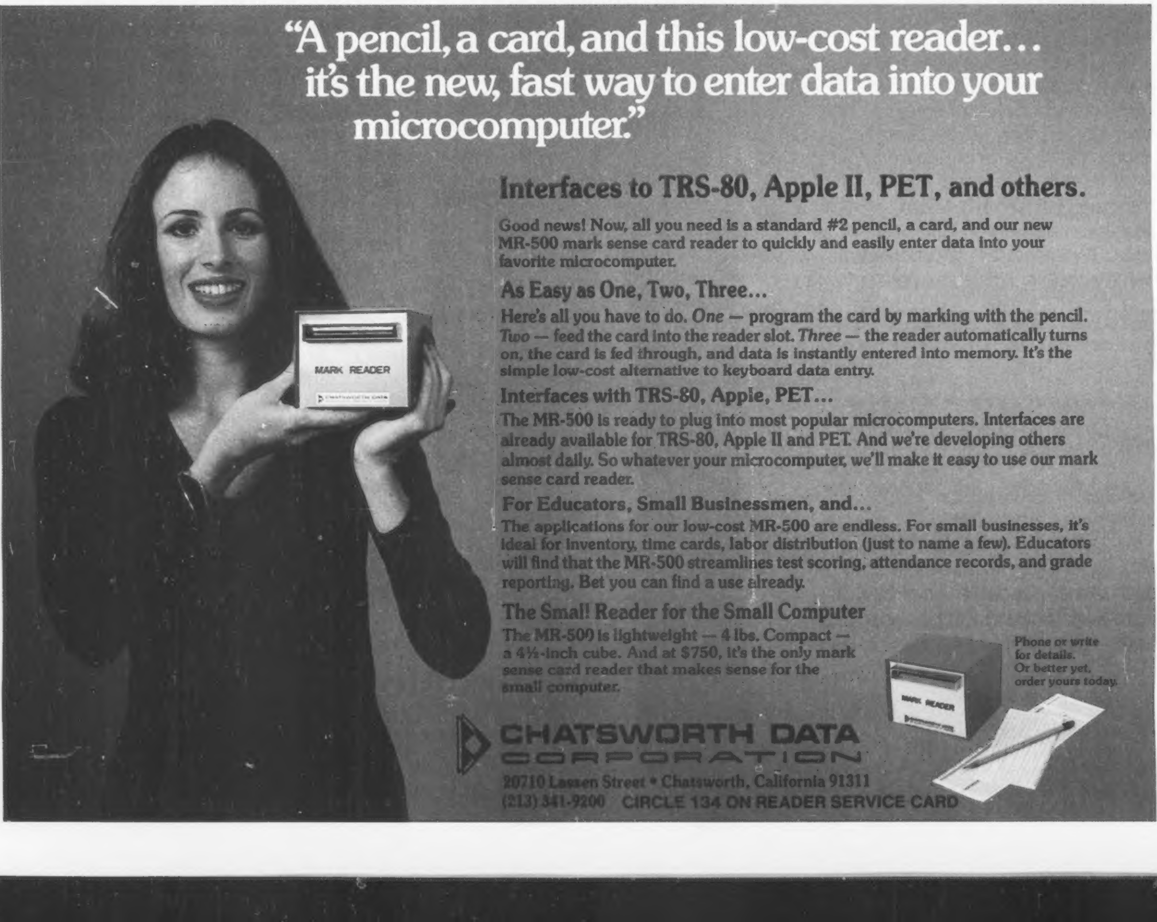
Since Mr. Marino doesn't seem to want to answer my letters, I was wondering if you could forward some names and addresses of people who would like to start a users' group for Mainframes. In this users' group, I would like to be able to have the members swap programs and data, write their own adventures such as a "Zork," and trade programming tips.

Any assistance that you could give me would be appreciated so much words couldn't describe it.

Walter A. Schwarz
Route 1 Mariner's Cove
Box F8 Garden Dr.
Estero, FL 33928

We hope lots of readers will respond to this plea. We even have a name we've been saving for just such a group: BUG—the Big Users' Group. Good Luck!—EBS





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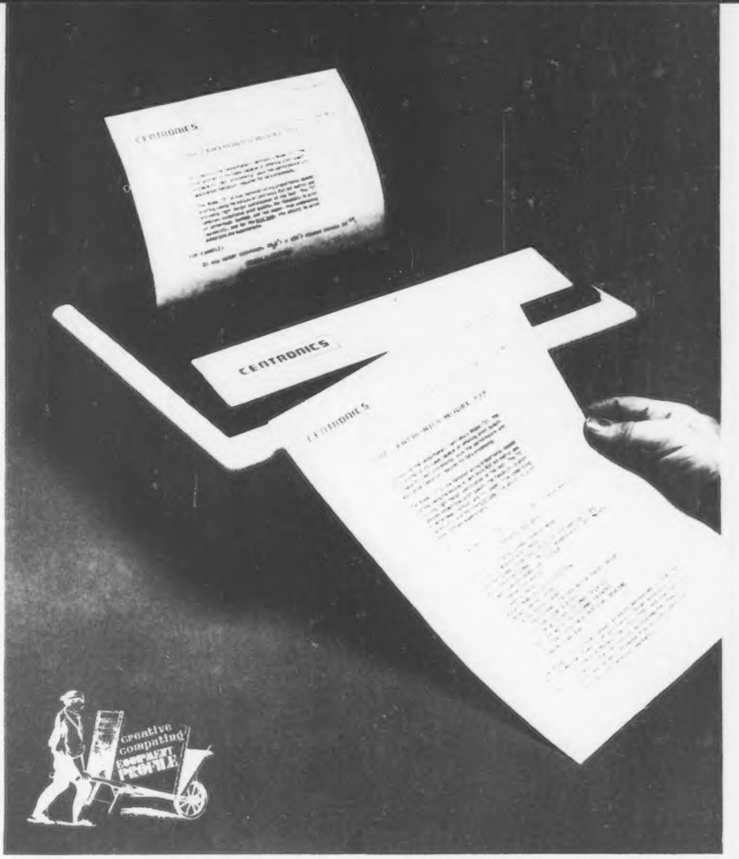

The Centronics 737

David Mannering

I have been watching the price of letter-quality printers for a couple of years. Although the cost of a formed-character printer has declined in that time, the decrease has been neither steady nor spectacular as it has been with other small-computer hardware. Today, it still takes over two thousand dollars to buy a daisy-wheel printer.

It was with some excitement, then, that I saw an announcement that Centronics Corporation had produced a letter-quality printer for under a thousand dollars. My excitement level dropped considerably when I read the announcement and discovered that the printer, the 737, produced dot-matrix characters, not pre-formed characters, "I'll believe it when I see it," I said to myself, and filed the announcement away for future reference.

A few weeks later I was in a local computer store, lamenting the high cost of letter quality printers, when the proprietor showed me a sample of the printing from the Centronics 737. I saw, and I believed, and I ordered one on the spot. I was excited again.

Eleven weeks later, when the printer finally arrived, I was not so excited. During that time I saw a 737 which I could have bought in another computer store. The only problem was that it didn't work. About the same time a friend of mine returned from a trip to another state, where he reported seeing another 737 which also did not work. No one seemed to know whether there was a problem with the printer itself or if it had just not been interfaced correctly, but it seemed like a bad omen to me.

I received a call from the computer store informing me that my printer had arrived. When I went to pick it up they had it unpacked, but they had been unable to test it because it didn't come with a connecting cable, and they didn't have the 40-pin edge connector required to make a cable. Thus, I made a 40 mile trip to Kansas City to get the connector before I tried out my printer.

Now comes the good news. After some minor problems with getting the edge connector tight enough on the ribbon cable, I plugged the 737 into the parallel port of my Sol-20, and it worked perfectly. I quickly wrote a little Basic program to test out the many features of the printer, and I was quite impressed with the print quality and the other special abilities that are available on the 737.

What It Has And Does

Some of the physical features of the printer include the ability to handle either single sheets, roll paper, or continuous forms on pin feeds which are nine inches apart. It can handle up to three-ply paper. On the front of the printer are a power switch, an online/local switch, and a line feed forward/reverse switch. The ribbon is a continuous Mobius loop and runs only when the printhead is not resting in the carriage return position. The printer makes no noise when it is not printing.

Print speed is 22 lines per minute at 80 characters per line. It interfaces to a parallel port with 7 ASCII bits and up to four control lines.

It's not much bigger than a breadbox and weighs twelve pounds. My price was $995, but I have seen advertisements for less.

Now for the internal features. First of all, there are three different character sets available. These are all standard ASCII characters, but they are formed with varying densities of dots. The regular characters are 7 x 8 matrix at 10 characters per inch, 80 columns per line. These look like the characters produced by just about any other dox matrix printer. Another set of characters available are also 7 x 8 matrix, but they are printed at 16.7 characters per inch. This is called the condensed mode and will result in 132 columns per line. Finally, there is the proportional character set.

The proportional character set is formed from a N x 9 matrix, where the 'N' may be from 6 to 18 — depending upon the character being produced. This produces text of very high quality. While you would

---

David Mannering, 1026 Tennessee, Lawrence, KS 66044.

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Centronics, continued...

never mistake these characters for those produced by a daisy-wheel, they far exceed the readability of any other dot-matrix characters I have ever seen.

In this mode the printer produces 80 columns per line, but you have the ability to make every line exactly the same length. Right-margin justification is possible in this mode, because you can tell the printer how many dot spaces to put between each character. Thus if you have a table of the widths of the different characters (supplied in the manual), you can adjust the spacing between words to produce right margins as straight as those in a book.

Within each mode, double-width characters are available to give you an additional three types of characters. One of my favorites is double-width condensed characters, which make very nice program listings. Also available at any time is the ability to underline text as it is printed.

Some of the additional features available include half-line feeds both up and down so that superscripting and subscripting are possible, and backspacing from 1 to 126 dot positions.

You can tell the printer how many dot spaces to put between each character.

All of the features I have mentioned are under software control. Typically the driver routine will send an escape character (Hex 1B) to the printer, followed by another character which is the code for the feature to be invoked. In Basic these features can be turned on or off by PRINT CHR$ functions or by OUT statements, but if you want to use the full capabilities of the printer in machine-language programs, be prepared to write a fairly intelligent driver routine.

The Centronics 737 is a line printer. This means that it buffers characters internally until a carriage return or line feed is received or until its buffer is full. It has an 80-character buffer in standard character mode, a 132-character buffer in condensed character mode, and an 1185-dot buffer in proportional character mode. It also has a separate line feed buffer which can store up to 255 linefeeds. The first line feed is executed as soon as it is encountered by the printer. While the stepper motor is executing the line feed, up to 255 more may be sent to the printer at the normal character rate. If the line feed buffer becomes full the printer will not accept any more characters until there is a space available in the line feed buffer. This buffer is entirely independent of the regular character buffer which can also be filled during the execution of the line feeds. The fact that it buffers characters means that a great many Basic programs that I have cannot be run using the printer as an output device because my Basic does not send a line feed to the printer after an INPUT statement. Thus I can only see the question I was answering on the printer after I have answered it. I have heard of Basics which fudge a line feed somehow to get around this, but mine doesn't.

The owner's manual for the 737 is one of the best pieces of documentation I have ever seen. It tells you everything you could possibly want to know, from detailed interface instructions to how to change the fuse. I simply cannot imagine anything that they left out.

Small Problems

I have only two suggestions for improvement for the 737. The first is a somewhat minor but frustrating feature of the double-width mode. It turns itself off at the end of every line. This is unlike the other features which stay on until you turn them off. In order to produce my double-width condensed-character program listings, my driver has to turn on double-width at the beginning of each line.

The owner's manual for the 737 is one of the best pieces of documentation I have ever seen.

My second suggestion is one of those things that seems totally out of place with respect to the design philosophy of the printer. The printer comes with the "auto line feed after carriage return" option on. In order to disable this, you must actually cut the lead to a resistor on the PC board. Then it is permanently disabled unless you buy another resistor and stick it in. As someone who deals with lots of different software and driver routines, I can tell you that it ought to be a little easier to turn this on or off. I am willing to bet that Centronics could have installed a tiny slide switch on the lead to the resistor and still have brought the price of the printer in under a thousand dollars. Ideally the feature should be software-selectable, like everything else on the printer.

Overall I am quite satisfied with the Centronics 737 and would recommend it for anyone like me who wants letter-quality printing capability but cannot justify spending more money on a printer than on a processor and disk drives. It may be just what you've been waiting for. (Centronics, Hudson, NH 03051.) □

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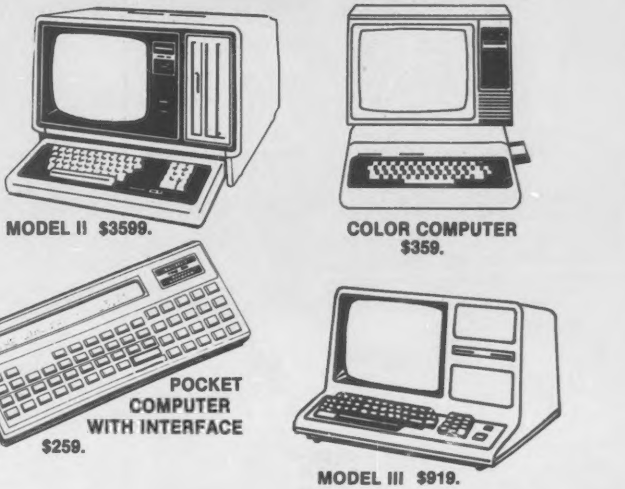
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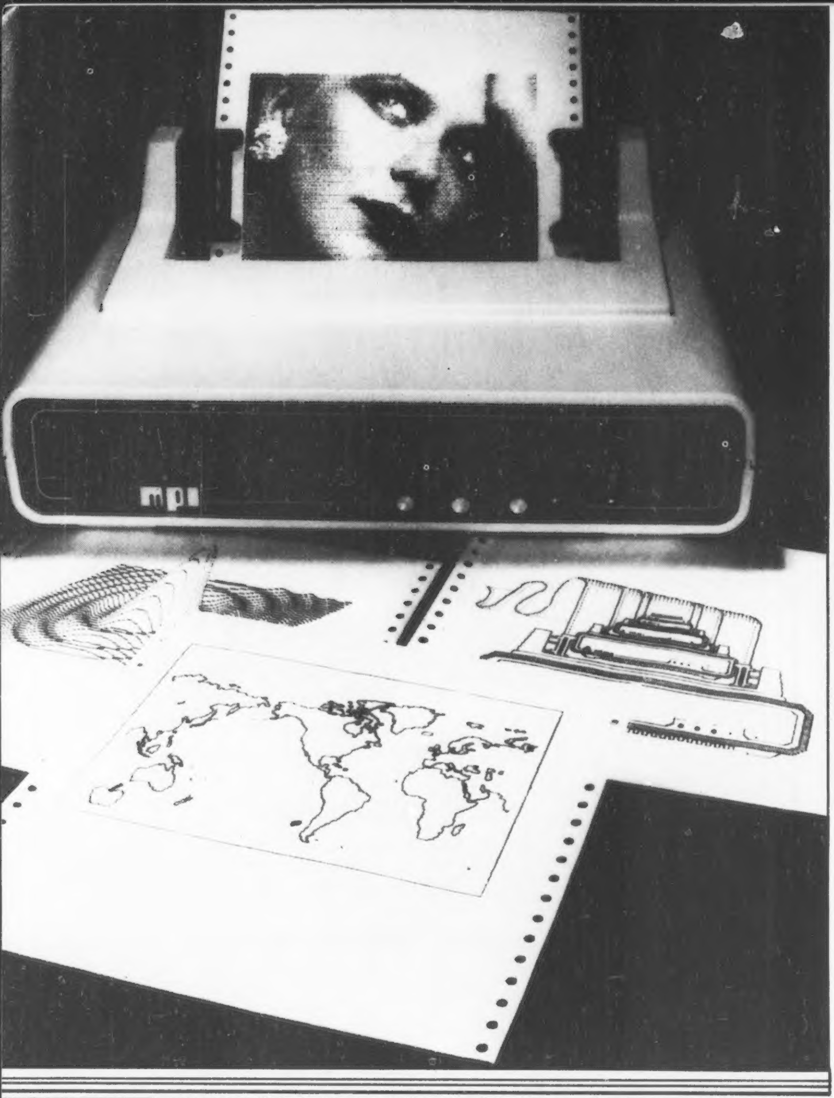


MPI 88G

Dale Archibald

creative computing
EQUIPMENT PROFILE

I'm not a computer hacker by any stretch of the imagination. I write freelance newspaper and magazine articles for a living—as many as I can, as often as I can. So when I discovered that word processors could make a writer's life easier, I decided to put one together using my Apple II Plus.

As a profession, magazine writing earns a little more than delivering newspapers. So, I had to make every penny count. Over the course of six months, I was able to bag everything I needed for my dream machine . . . except the printer.

Ideally, of course, a letter-quality printer would have suited me best. As I'm sure the editors of *Creative Computing* will admit, many of the manuscripts that arrive on their desks are in dismal shape. Not just because of poor writing, but also due to strange-colored paper, worn-out ribbons, smudges, pencil scrawls, etc. Together, these form the gauntlet nearly every editor runs at each mail delivery. I didn't want to add to their problems by using a poor typeface.

Realistically, though, a letter-quality printer cost three times more than I wanted to pay. In addition, they were slower than a dot-matrix, and perhaps more subject to mechanical problems.

I also decided against the typewriter attachment that features little solenoids that strike the keys of an electric typewriter. They were too much like the long-lost cousins of a a pinball machine to suit my taste. Also, they cost practically as much as some of the new dot-matrix printers.

Thermal printers, with aluminum paper, were out of the question.

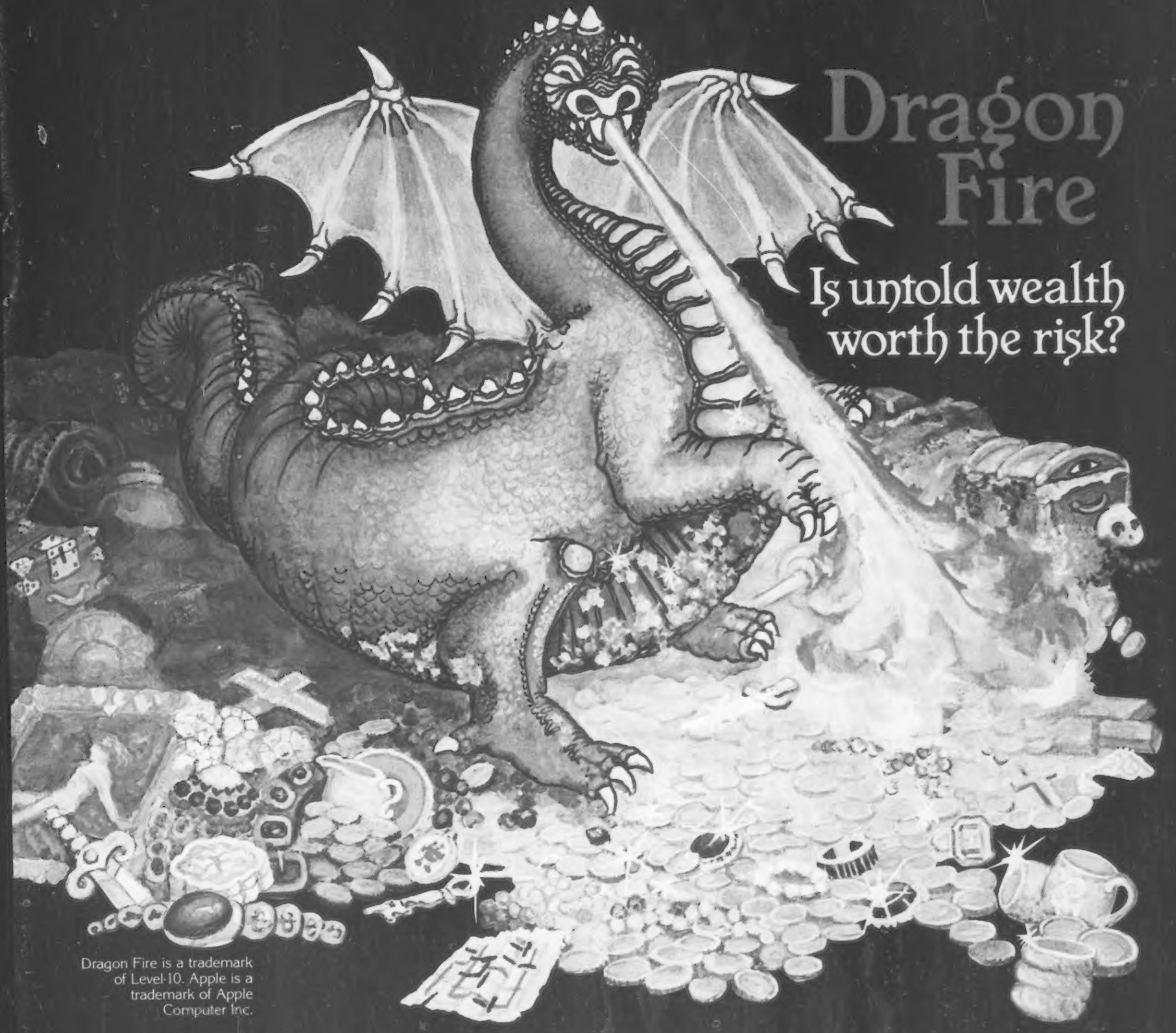
But before I made my final selection, I polled some of the editors I write for. "Would you object to articles arriving on your desk in dot-matrix form?" I asked. Not one of them had any objection after I had explained what dot-matrix was.

So I asked around, looked around, and settled on the M.P.I. 88G. This is the second printer in the Micro Peripherals, Inc., line, and retails for $749.

The main reason I picked it was its print quality, naturally. The fact that it could do graphics was gravy.

The machine prints a normal 7 x 7 matrix in 10 characters per inch (c.p.i.), 12 c.p.i., and 16.5 c.p.i. bidirectionally. More important, it has what the company terms a correspondence type, an 11 x 7 matrix, 10 c.p.i. That typeface looks so good one editor I checked with hadn't even realized it was a dot-matrix. ("Hey, the letters are made up of litte dots!") The characters don't have descenders, but otherwise look very good, with solid type and nice black edges.

Dale Archibald, 1817 Third Ave. N., Minneapolis, MN 55405.


Dragon Fire™
Is untold wealth worth the risk?

Dragon Fire is a trademark of Level-10. Apple is a trademark of Apple Computer Inc.

Salmadon is no ordinary creature. Fables describe him as a nightmare made flesh. His dungeon is ten (10) levels deep and filled with hideous creatures.

They dwell within the maze of caverns for only one reason: to keep you from reaching the Great Dragon and his wealth. There is no map. The levels and rooms seem to rearrange themselves at will.

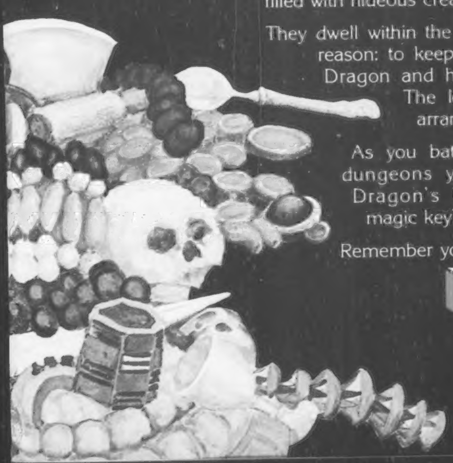
As you battle your way deeper into the dungeons you find keys to the Great Dragon's lair. But which one is the magic key?

Remember you cannot take the wealth from Salmadon's lair without slaying him, and you cannot slay the great dragon without one of the right keys.

Dragon Fire is an intricate strategy adventure with 170 monsters guarding over 150 different treasures.

The random generation of the rooms and mazes makes each game unique. It can be played on a color or black and white monitor. It includes sound, hi-res graphics and a "save the adventure" feature.

Dragon Fire is written in Integer Basic for the Apple II and Apple II Plus with 1 disk drive and 48K RAM. Contact your local computer store, hobby store or contact Level-10, a subsidiary of Dakin5 Corporation, Post Office Box 21187, Denver, Colorado 80221.



LEVEL-10™

A subsidiary of Dakin5 Corporation.

CIRCLE 122 ON READER SERVICE CARD

The Perfect Fit

The Micromodem II data communications system and the Apple II* computer. What better combination to maximize the capabilities of your personal computer!

This popular direct connect modem can transmit data between an Apple II and another Apple II, a terminal, another microcomputer, minicomputer or even a large time-sharing computer anywhere in North America. The Micromodem II has unique automatic dialing and answer capabilities which further increases the communications possibilities between the Apple II and another computer or terminal.

You can send and/or receive messages or data when you are out of your office, home or out of town. Your branch business locations can communicate with each other regarding inventory and other matters over the phone. Or you can communicate with friends across the country. And you can access information utilities like the SOURCE for various business and personal applications.

The Micromodem II consists of two parts. One part includes the printed circuit board which holds the Micromodem II, ROM firmware and the serial interface. The board plugs directly into the Apple II providing all the functions of a serial interface card plus programmable auto dialing and auto answer capabilities. The on-board ROM firmware enables the Micromodem II to operate in any of three modes to perform different tasks-terminal mode, remote console and program control mode.

The other part of the Micromodem II datacomm system is a Microcoupler which connects the Micromodem board and Apple II to a telephone line. The Microcoupler gets a dial tone, dials numbers, answers the phone and hangs up when a transmission is over. There are none of the losses or distortions associated with acoustic couplers. The Microcoupler is compatible with any North American standard telephone lines and is FCC-approved for direct connection in the U.S. It works with standard dial phone service or Touch-tone service.

The Micromodem II is completely compatible with Bell 103-type modems. Full and half-duplex operating modes are available as well as speed selectable transmission rates of 110 and 300 bps.

Why not increase your Apple II's capabilities by outfitting it with the sophisticated Micromodem II data communications system? The Micromodem II is available at retail computer stores nationwide. For the store nearest you, call or write:

Hayes™

Hayes Microcomputer Products Inc.
5835 Peachtree Corners East, Norcross, Georgia 30092 (404) 449-8791

™ Micromodem II is a trademark of Hayes Microcomputer Products, Inc.
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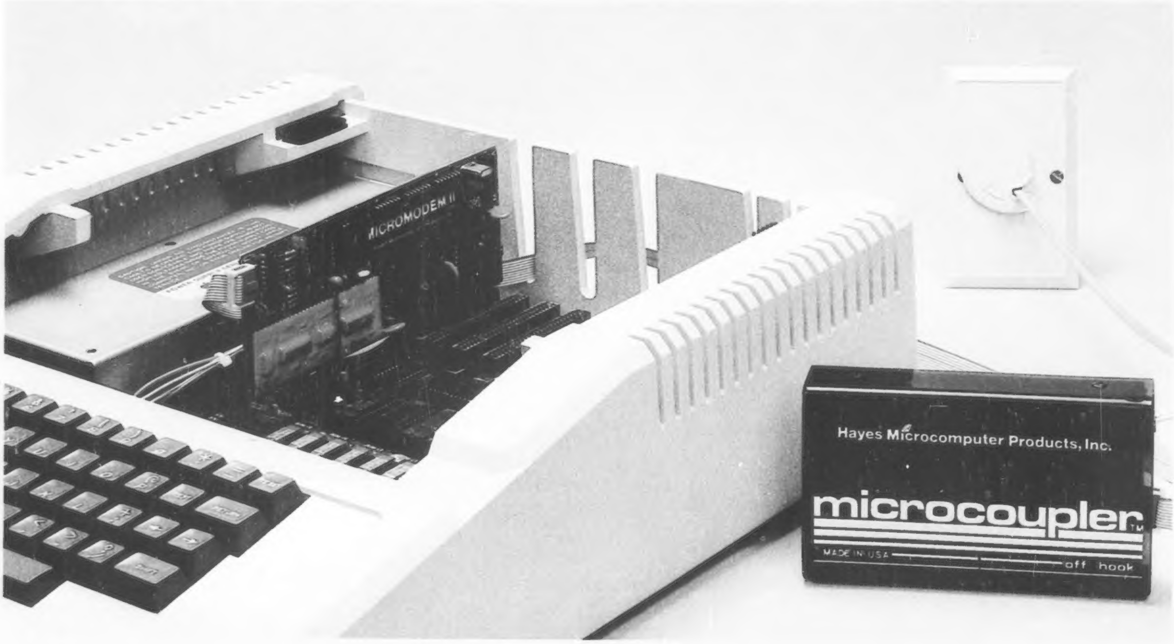
The Micromodem II can also be used with the Bell & Howell computer.



CIRCLE 153 ON READER SERVICE CARD

MPI, continued...

The ribbon is a continuous loop cartridge with a 5-million-character life. It snaps on and off in seconds.

The 88G has a full upper and lower case, 96-character ASCII set, with software selectable single or double width characters. The height of the characters is .10 inch. It offers an eight-inch line length with 80, 96, or 132 characters per line, depending upon the c.p.i. And it will line space six or eight lines per inch, user selectable. Because of the graphics, a 1K buffer is standard; 2K is optional.

Physically, the 88G is very close to the color of my Apple II Plus. It measures 10 3/4" x 16 1/4" x 6 1/4", and weighs less than 15 pounds.

There are three buttons and two lights on the front of the printer, plus an on-off switch and fuse on the side. One of the lights is for power on; the other lights when the Selection button is pushed in, to show the printer is connected to the computer.

The three front buttons are the Paper Advance, Top of Form, and Select. The Select button determines whether the printer can communicate with the computer, by locking in or out. (Changing the setting during printing stops the machine. Push it back in, and it begins printing again.) The Top of Form button boosts the paper up a dot at a time to reach the top. The Paper Advance moves the paper up one line; if it's held in, after half a second paper will feed until the button is released, or the next Top of Form is reached.

The machine has a Power-On Confidence test. If the switches inside the case are set to that, the printer will test itself each time it is turned on. The same results can be realized from the outside by a Self-Test. Press the Select button in, then press the Paper Advance and Top of Form buttons at the same time. The printer starts pounding out all the characters it offers across the sheet, and continues until the buttons are released.

Paper feeds in from underneath, but the loading isn't as awkward as it may sound: the machine is designed to stand on its back (or if it's not designed to, it seems as if it were). An operator can use standard 9 1/2" tractor-feed paper, roll-feed paper, single sheet paper, or labels. I've even tested it on invoice forms with multiple carbons, and it seems to do an adequate job.

In fact, it offers a forms control that lets the user select any of sixteen form lengths, and has a "skip-over-perforation" control.

One new attachment holds roll-feed paper behind the printer. Another will allow the user to slide single sheets such as letterhead in from the front, without having to make the machine do its balancing act.

Adjustable tractors accommodate labels or odd-sized paper. Just flip a lever on the tractor and slide it along the rods to the correct spot. Tighten, and it stays there. If you're running single sheets, a pressure roller is used.

How fast is it? At full bore, printing in 7 x 7 matrix, it's supposed to hit 100 characters per second. But the throughput—the actual number of lines per minute (l.p.m)—ranges from 55 l.p.m. at 10 c.p.i. to 36 l.p.m. for the correspondence font. Supposedly it'll hit 150 l.p.m. for short lines—handy for printing program listings.

I asked the distributor about the printhead life. He claimed 10 million characters. Changing it requires only unscrewing two Phillips head screws, sliding the old head off and the new head on, plugging in the jack, and screwing the two screws back in. A five minute job, even for me.

Repair problems are almost as easy. To change an electronics board requires removing three screws and ten minutes work. All dealers, distributors and sales representatives have replacement boards. A higher-level service center could replace a bad chip or other component.

According to the sales literature, the 88G will operate either parallel, with a Centronics type seven-bit ASCII; or serial RS-232C at 110, 150, 300, 600, or 1200 baud; 2400, 4800, and 9600 baud are optional, as is an IEEE-488 BUS interface.

The main reason I picked it was its print quality, naturally. The fact it could do graphics was gravy.

Now for you graphics lovers!

According to the technical memo I have, the 88G operates on a dot addressable basis, with each dot position under control of the host computer.

Vertical resolution is 72 dots per inch (d.p.i.). Horizontal resolution—available by either switch or software control—is 50 d.p.i., 60 d.p.i., 72 d.p.i., or 82 d.p.i., with dot diameter at .014.

All graphics printing is done in unidirectional mode, but a "quick return" brings the print head back to the left margin quickly.

Six vertical dots can be printed simultaneously on each line, and the paper can be advanced in steps of zero to 15 dots for each command. The top of the seven solenoids for the printer differentiates between graphics and control information. There is no automatic wraparound in graphics: all bytes beyond the selected line length are tossed.

The unit I bought here in Minneapolis has a hi-res graphics program as standard equipment, attached to the cover of the manual. The distributor claimed it is easily equivalent to some selling for over $40. Unfortunately, that program may not be automatically furnished in other parts of the country. Ask your dealer about it.

Of course, the 88G isn't perfect. I wish there were some sort of mark on the machine to help me line up letterhead, but that's a detail. I can use a pencil mark for that, or invest in the front-loading attachment for around $25.

Another minor problem is the tendency of the machine to leave faint lines across tractor-feed paper and labels. It may be due to ink rubbing off of one of the metal plates. It seems to be at its worst on labels, and nonexistent on pressure feed single sheets. Perhaps as the ribbon wears a bit it will disappear. The problem is a minor annoyance.

The scream it prints at is a noise of another tenor. When it's clippin' along at the slowest throughput of 36 lines per minute, it shrieks like a rusty knifegrinder.

The noise doesn't bother me for the short time it runs to type out an article (although it jolts the puppy out of her nap in a hurry when it starts). I imagine if the machine were used in an office, or next to the kids' bedroom, it would probably get obnoxious real fast.

Here again, though, there's another attachment on its way to cut the db's by a claimed 50 per cent. I also defy anyone using an impact printer to have absolutely no noise when printing.

Altogether, I'm very happy with the 88G. I may even be tempted into playing with graphics, since the machine has that capability. I recommend it.

Micro Peripherals, Inc., 2099 W. 2200 South, Salt Lake City, UT 84119. ☐

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"Didn't you hear me say I was setting my end down, Bill?"

Project 80

80 Columns for the Apple

Joe Alinsky and Winston Gayler

One of the differences between the video output of the Apple computer and that of many "professional" units is the 40-column display of the Apple. For those of us used to the "normal" 80 columns of characters, the Apple limitation can be frustrating. This is particularly true when interfacing with equipment that either offers or demands 80 columns. The reason Steve Wozniak designed the Apple with only 40 columns is good: the Apple was originally intended to be used with a standard B&W or color TV, and the bandwidth on these sets is simply not wide enough to provide the necessary resolution needed to make individual letters and characters legible at 80 columns.

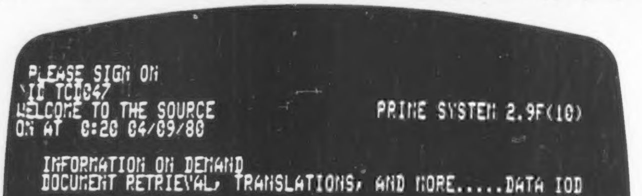
With the advent of such information data banks as the Source and Micronet, a serious drawback to the 40-column display has become evident. Both the Source and Micronet require a standard 80 column terminal. (See Figure 1.) When used with the Apple, textlines are disconcertingly broken up, sometimes reducing the overall legibility of the text.

In addition, when using a text editor it is difficult to see how a page will look in the final printed version if your margins are set at 10 and 75 and your video display will not extend that far.

Three manufacturers of Apple Peripherals have addressed the problem and come up with plug-in boards that are unique in both design and operation. Yet, all three designs do display an 80-character line.

We have tested all three products from both engineering and user standpoints. Through the text and accompanying charts and photos, we have tried to provide the information that will make it easy for you to choose the board that fits your needs.

Before discussing each board separately, we have compiled a list of those features that are common to all three boards.



```
PLEASE SIGN ON
`ID TCI047
WELCOME TO THE SOURCE                       PRIME SYSTEM 2.9F(10)
ON AT  0:20 04/09/80

  INFORMATION ON DEMAND
  DOCUMENT RETRIEVAL, TRANSLATIONS, AND MORE.....DATA IOD

  INFORMATION THRU NEXT DAY'S MAIL...............DATA DATAPOST

  TAX INFORMATION................................DATA TAX

  D.C. HOTLINE...................................UPI N G NA--W

  ORGANIZE YOUR PORTFOLIO INFO...................DATA FOLDEX

  PERSONAL INFORMATION RECORD....................DATA PERSON

  TRAVEL INFORMATION.............................DATA TRAVEL

  FUTURE INFORMATION.............................DATA ASTALT
                                                 DATA ESP
```

Figure 1. Source Message of the Day menu on the Double Vision. Note what 80 columns does for the Source.

Common Characteristics

1) The boards plug into Apple peripheral slots (slot 3 for the Sup'r'terminal; any slot except 0 for the others).

2) All obtain power from the Apple (and all use lots of it).

3) All have composite video output, 80 columns with 24 lines of text. (The Videx board changes the number of lines depending on dot-matrix size.)

4) All display upper and lower case characters.

5) All allow keyboard selection of lower case.

6) All the boards require an actual B&W monitor, not just a TV. Even televisions with excellent resolution, displaying a good image with Apple's 40-column output will probably be disappointing with any of the 80-column boards.

7) None of the boards will handle all 128 ASCII characters from the keyboard, e.g., underscore, backslash, etc.

8) All are more difficult to read and will cause a lot more squinting than the 40-column display. One obvious reason is that the letters are smaller.

9) All the boards enable the user to view either Hi- or Lo-Res graphics on a regular television connected to the Apple video output, while viewing text on a monitor connected to the 80-column output. But, in the mixed graphics/text mode, the television set does not get the four lines of text at the bottom.

10) Once installed, it is impossible to see anything on your monitor without running the board's software or doing a PR#. All video is routed through the boards. It is possible to see the display through a separate conventional television (connected, of course, through an rf modulator). See the special note at the end of the Videx section.

11) CRT controller chip: All the units have a controller chip that provides the following hardware functions: horizontal and vertical timing; horizontal and vertical sync outputs; programmable cursor; text window manipulation; light pen register; screen memory addressing; character

---

Joe Alinsky, P.O. Box 1411, Canoga Park, CA 91304.

Winston Gayler, 77 Ortega Ave., Mountain View, CA 94040.

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Regular adult admission is just $3 per day. You can register at the door, or use the pre-registration form.

If you use the Apple, or are thinking about buying one, you won't want to miss a minute of Applefest '81.

Saturday, June 6 — Sunday, June 7, 1981

11:00 A.M. - 7:00 P.M. Saturday; 11:00 A.M. - 6:00 P.M. Sunday

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generator row addressing; interface to the microprocessor bus.

Point 11 has several implications for the 80-column board user. By using a CRT LSI chip, the designer can minimize the parts count, power, and cost. Also, the user can access the programmable cursor, and future software could use the light pen input present on this chip. As a last note on this subject, one of the boards (M&R) uses the text window manipulation ability.

Videx Videoterm

Of all the boards, only the Videx provided a first class manual to accompany its product.

Included in its book were a complete schematic, theory of operation, and commented source code (how rare!). In addition, instructions are given on how to generate your own character set and instructions on directly accessing the CRT controller chip registers. As Apple recommends to all peripheral manufacturers, all firmware is contained in EPROM and a simple PR# command fires up the board.

One of the most interesting and useful features of the Videx board is the ability to control the dot matrix cell size. Table 1 indicates the choices available.

CELL SIZE (HxV)	CHAR. SIZE	SCREEN FORMAT
8x10	7x9	80x24
9x10	8x9	80x23
8x12	7x11	80x20
9x12	8x11	80x18

Table 1

Simple keyboard commands allow the user to pick any of the dot matrix cell sizes available. (See Figures 2 and 3.)

By adding an optional 2708 or 2716 EPROM, it is possible to generate your own character set. The EPROM expands this character set by 64 or 128 characters.

Any 80-column board being used with a text editor must contend with the problem of shifting between upper and lower case. Obviously, when one is entering text for later hard-copy printout, it is nice to hit the "shift" key for upper-lower conversion as on a normal typewriter. At the very least, one should expect to strike a single key that can be reached relatively easily by the left hand little finger.

Unfortunately, Videx appears to have gone out of its way to make this a difficult task. It is necessary to hit a "ctrl A" (two keys) in order to shift. But that's not all.

Normally, after striking the "shift" key on a typewriter, it returns to lower case mode after release of the key. Not so on the Videx. The "ctrl A" arrangement is a toggle situation. Switch it "on" with a "ctrl A," and it stays in upper case until you do another "ctrl A." In order to type the word "Apple" with the "A" capitalized, it is necessary to hit four superfluous characters, (the ctrl key twice, and the "A" twice). Although a software fix to any text editor program might be possible, this is a design limitation that must be reckoned with. In talking with the manufacturer, they have indicated that a hardware fix for this might appear sometime in the future, but it is not available at this time. Those of you who decide the Videx is the board to buy should contact the manufacturer to find out when and if this mod will occur.

We discovered another problem with the "ctrl A" arrangement. It can do strange things from within a program. At one point in utilizing the Videx Videoterm with a program of ours, we found the program displaying lower case the first time it ran, upper case the second time, then lower, etc. Presumably, this was due to an embedded control A causing the toggling effect between upper and lower case.

The user should experiment with the four matrix sizes to find the one that goes best with his eyes and monitor. We found the display slightly difficult to read on a 9" Sanyo, but it reproduced very well on a 9" Hitachi and 12" Leedex monitor. The user may also find it necessary to adjust the "height" control (usually found on the back) on his monitor.

It should also be mentioned that many functions and commands do not work with each of these boards. This is particularly true of control characters and escape functions, although on the Videoterm board such common commands as "Home," "Text" and "Vtab" do not appear on the screen. There are, however, substitute control characters that perform the same functions.

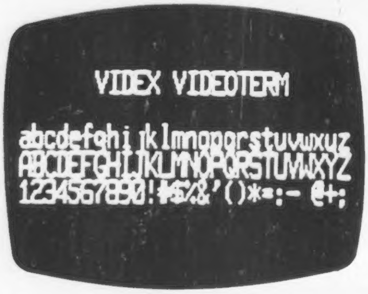
Videx provides an optional switch to allow normal viewing when the normal 40-column display is desired. We thought this was an unusual show of concern for the end user, and demonstrates good forethought on Videx's part.

Double Vision

As with the Videx, the Double Vision board plugs into any slot. However, the manner in which the board is initialized, or "fired up," differs from the Videx. Instead of a straight PR#, it is necessary to boot a disk containing the software for the board. We believe it is important to emphasize that if you are only using a monitor and are not simultaneously plugged into a standard television (through a modulator) you will not be able to see anything until you boot the Double Vision disk. If for some reason you do not wish to have 80-columns for a period of time, you will have to remove the connector from the board and re-plug it into the back of the Apple, unless of course, you have that separate TV.

Once the disk is up and running, we found the Double Vision display on the Sanyo and Hitachi to be a bit (no pun intended) better then the Videx board on these same monitors. The characters are not as close together as on the Videx. (See Figure 4.) This is probably due to the smaller 5 x 7 matrix. With the smaller matrix, any one character is less well-formed, but the whole screen of characters is easier to read.

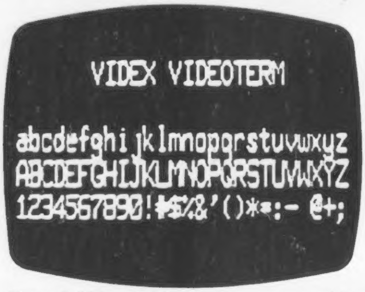
Another plus of the Double Vision board



VIDEX VIDEOTERM

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890!#$%&'()*=:- @+;

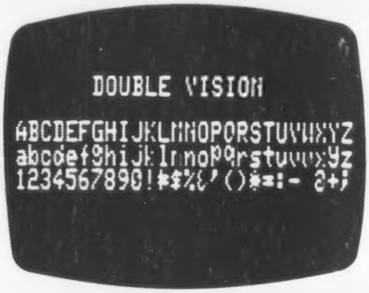
Figure 2. Videx with the default option of 80 characters x 24 lines. Note the narrow vertical spacing between lines.



VIDEX VIDEOTERM

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890!#$%&'()*=:- @+;

Figure 3. Videx with the format programmed for 80 characters x 20 lines. Note that with fewer lines there is more space between lines and the true descenders are evident.



DOUBLE VISION

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!#$%&'()*=:- @+;

Figure 4. DoubleVision: The lower case g, y, p, q, etc. are a little awkward, but the overall text is easy to read.

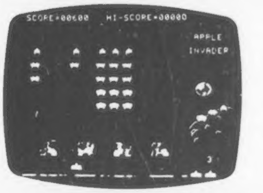
Apple II

sensational software

creative computing software

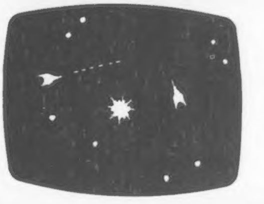
Super Invasion and Space War

Disk CS-4508 $29.95
Requires 48K Apple II or Apple II Plus



Super Invasion

This original invasion game features superb high resolution graphics, nail biting tension and hilarious antics by the moon creatures. Fifty-five aliens whiz across the screen, quickening their descent, challenging you to come out from behind your blockades and pick them off with your lasers. A self-running "attract mode" makes it easy to learn and demonstrate the game. Game paddles are required.



Space War

Take command in Space War. Select from five game modes, including reverse gravity, and the battle begins. Challenge your opponent with missle fire, force him to collide with the sun or to explode upon re-entry from hyperspace. Be wary. . . He may circle out of sight and re-appear on the opposite side of the galaxy. (This is the classic MIT game redisgned especially for the Apple.)

3 Adventures

Disk CS-4513 $39.95
Requires 48K Apple II or Apple II Plus

Adventureland (by Scott Adams) You'll encounter wild animals, dwarfs and many other puzzles and perils as you wander through an enchanted world, trying to rescue the 13 lost treasures. Can you rescue the Blue Ox from the quicksand? Or find your way out of the maze of pits? Happy Adventuring!

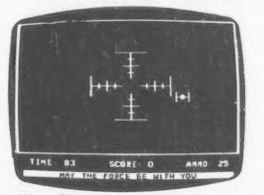
Pirate Adventure (by Scott Adams)— "Yo Ho Ho and a bottle of rum. . ." You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your London flat to Treasure Island. Can you recover Long John Silver's lost treasures? Happy sailing matey. .

Mission Impossible Adventure (by Scott Adams)— Good Morning. Your mission is to. . . and so it starts. Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed? This one's well named, its hard, there is no magic but plenty of suspense.

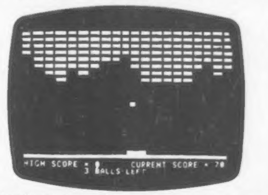
Good Luck . . .

Space and Sports Games

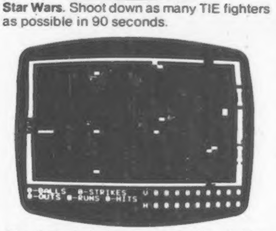
Disk CS-4501 $24.95 8 programs Requires 32k Apple II or Apple II Plus



Star Wars. Shoot down as many TIE fighters as possible in 90 seconds.



Breakout. Four skill levels and improved scoring make this the best breakout ever.



Baseball; A 2-player game with pitching, batting, fielding, stealing and double plays.

Saucer Invasion. Fire missles to destroy the invaders who fly at different speeds and altitudes.

Rocket Pilot. Maneuver your spaceship over the mountain using horizontal and vertical thrusters.

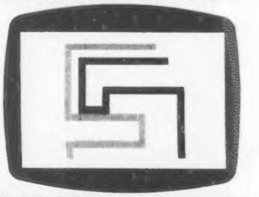
Torpedo Alley. Sink as many warships as possible in 2 minutes.

Darts. Use game paddles to control the throw of 6 darts.

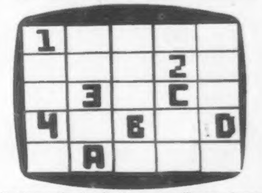
Dynamic Bouncer. A colorful, ever-changing graphics demonstration.

Strategy and Brain Games

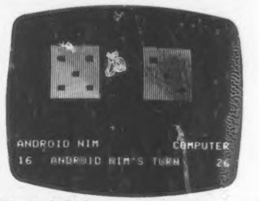
Disk CS-4502 $24.95 12 programs Requires 32K Apple II or Apple II Plus



Blockade. Build a wall to trap your opponent, but don't hit anything.



Dodgem. Be the first to move all your pieces across the board in this intriguing strategy game.



Skunk. A 2-player strategy game played with dice, skill and luck.

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To order any of the software packages listed above, send payment plus $2.00 postage and handling per order to Creative Computing, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may be called toll-free to **800-631-8112** (In NJ, 201-540-0445).

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is that it allows escape key cursor movements. Both single key (escape D,A,C,B) and multiple key (escape I,J,K,M) cursor operations are allowed. In fact, if you don't have the autostart ROM or an Apple II Plus, the Double Vision will give you multiple key cursor moves and stop list!

As mentioned before, we feel shifting to upper case is a function that should be easy. The Double Vision board accomplishes this nicely in two ways: Escape Key: hit the escape key once and the next letter is upper case, or Shift Key: This requires a one-wire modification to your Apple. The Double Vision manual explains how this is accomplished. After the modification is complete, holding the shift key down while hitting a key prints it in upper case. Releasing it returns you to lower. This is true shift key operation. However, the shift-lock is not so easily accomplished. It is necessary to type "crtl E" to shift-lock, then "escape, ctrl z" to get back to lower case again.

We also discovered that while in the Double Vision software, neither Basic nor DOS responds to lower case.

The Double Vision uses a CRT controller chip, as do all the units, however, no instructions are given on how to access its registers.

M&R Sup'r'Terminal

The first thing you notice is its size. This is the largest board we have ever seen for the Apple. It looks like something that belongs in an S-100 bus! In addition, there is a small piggyback board that plugs into an IC socket on the Apple motherboard.

Unlike the other two boards the M&R is slot dependent; it must be plugged into slot 3. Its on-board firmware is contained in a 2716 EPROM and is activated by a PR# command (as is the Videx).

The M&R is the power-hungry champ of the three boards. We were interested in this and upon investigation, discovered that the M&R design places a power resistor on the board between the +5 and +12 volt supplies. This appears to be a method of transferring some of the +5v load to the +12v supply. Indeed, the M&R has the lowest +5v current drain of the three boards. (See Table 2.)

Checking further, we found our +5v supply near capacity (2.5 amps as specified by Apple). The 12v supply had considerable margin, as might be expected. The logic therefore, of transferring the +5v load to the 12v supply appears to be sound. However, the trade-off here is increased power dissipation (heat) inside the Apple.

Since all the boards generate a fair amount of heat (the M&R more than the others), we feel a better design for all three manufacturers would be to use power-down circuitry (again as Apple recommends) or a simple on-off switch.

The Sup'r'Terminal can be loaded with

GENERAL:			
Manufacturer	Videx	Computer Stop	M&R Enterprises
Model	Videoterm	Doublevision	Sup'r'terminal
Basic Price	$345	$295	$395
HARDWARE:			
IC Quantity	24	20	31
Sockets	Y	Y	Y
Memory Required	16K	48K	N/A
Disk Required	N	Y	N
Typical Current Drain +5v	400ma	400ma(570ma)	380ma(380ma)
+12v	30ma	0	190ma(210ma)
-5v	15ma	0	(1 microamp)
-12v	0	0	0
Total Power	2.4 W	2 W (2.9 W)	4.2 W (4.4 W)

Note:
Current values are average as provided by the manufacturers. Powers are derived from the currents. Values in parentheses were measured on early boards.

SOFTWARE:	2708 EPROM at C800-CBFF	1.5K of machine Code loads from disk to RAM just below DOS	2716 EPROM at C800-CFFF
Keyboard Characteristics:			
Shift Method	CTRL A	ESC or Shift Key	CTRL A or Shift Key
Shift Lock	Y	Y	Y
Cursor Escape Functions	N	Y	Y
Ctrl U copy	N	Y	Y
DISPLAY CHARACTERISTICS:			
Dot Matrix	(Varies- See Table 1)	5 x 7	5 x 8
Cursor	P	Blinking Rectangle	P
Inverse Character	Y	Y	Y (alpha only)
Control Character	Y	N	N
Graphics	Limited	N	N
True Descenders	Y	N	Y
Flashing Character	N	N	N
X-Y Cursor Addressing	Y	Y	Y
COMPATIBILITY:			
DOS 3.1	Y	N	Y
DOS 3.2	Y	Y	Y
Com Card	*	*	*
Integer Basic	Y	Y	Y
Applesoft	Y	Y	Y
Pascal	C	C	C
Peripherals	**	**	**
Unltd.Text Ed. Ver.3.0			
Apple Pi	**	**	**
Serial Card	C	N/A	C
Micromodem	C	N/A	N/A
Lower Case Basic	Y	N	N
and DOS commands "HOME." "VTAB." etc.	N	Y	N

* Only with additional software (B.I.T.S.. etc.)
** Both software companies claim compatability with all the boards soon.

DOCUMENTATION:			
Schematic	Y	N	N
Source Listing	Y	N	N
Theory of Operation	Y	N	N
Manual Length (in equivalent 8 1/2 x 11 pages)	56	13	33
OPTIONS:	Graphics $25 EPROM Video Switch Plate $12	Pascal Software $25	

GRAPHICS
FOR 80 COLUMN PETS

The Integrated Visible Memory for the PET has now been redesigned for the new 12" screen 80 column and forthcoming 40 column PET computers from Commodore. Like earlier MTU units, the new K-1008-43 package mounts inside the PET case for total protection. To make the power and flexibility of the 320 by 200 bit mapped pixel graphics display easily accessible, we have designed the Keyword Graphic Program. This adds 45 graphics commands to Commodore BASIC. The image on the screen was created by the program below. If you have been waiting for easy to use, high resolution graphics for your PET, isn't it time you called MTU?

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CBM
Model 8032
computer

NOW 80 COLUMN PETS CAN HAVE MTU HIGH RESOLUTION GRAPHICS

```
 10 VISMEM: CLEAR
 20 P=160: Q=100
 30 XP=144: XR=1.5*3.1415927
 40 YP=56: YR=1: ZP=64
 50 XF=XR/XP: YF=YP/YR: ZF=XR/ZP
 60 FOR ZI=-Q TO Q-1
 70 IF ZI<-ZP OR ZI>ZP GOTO 150
 80 ZT=ZI*XP/ZP: ZZ=ZI
 90 XL=INT(.5+SQR(XP*XP-ZT*ZT))
100 FOR XI=-XL TO XL
110 XT=SQR(XI*XI+ZT*ZT)*XF: XX=XI
120 YY=(SIN(XT)+.4*SIN(3*XT))*YF
130 GOSUB 170
140 NEXT XI
150 NEXT ZI
160 STOP
170 X1=XX+ZZ+P
180 Y1=YY-ZZ+Q
190 GMODE 1: MOVE X1,Y1: WRPIX
200 IF Y1=0 GOTO 220
210 GMODE 2: LINE X1,Y1-1,X1,0
220 RETURN
```

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Four programs (pitch discrimination, interval recognition, chord recognition, and scale recognition) for the ALF MC16 music card (described above) are available on disk (or cassette). Under $50 for the set, see your local Apple dealer.

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Project 80, continued...

KEY TO TABLE

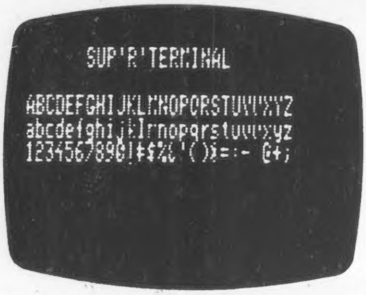
All table entries should be self-explanatory except the following:

ctrl U copy:
This feature which is inherent in the Apple's 40-column system allows you to copy characters from the screen using the right arrow key (ctrl U)

X-Y Cursor addressing:
A feature often found in CRT terminals that allows you to directly position the cursor via X-y coordinates.

Y	Yes
N	No
C	Claimed by the manufacturer but not tested by the authors
P	Programmable

custom character fonts (type faces) from disk or tape. Up to ten fonts can be held in a "staging area" located in RAM and then quickly transferred to the Sup'r'terminal for display. The preliminary manual includes a utility program, "Font Compressor," to aid this process. (See Figure 5.)



```
SUP'R'TERMINAL

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!#$%&'()*=:- @+;
```

Figure 5. Sup'r'terminal displays good readability.

Like the Double Vision, this board adds ESC I,J,K,M cursor moves and stop list to the Apple. It also accomodates an optional one-wire hardwire modification for true shift key operation. The shift procedure is as follows: without mod: ctrl A, activates lowercase; single ctrl A, next letter is upper case; double ctrl A, caps lock. With mod: ctrl A; activates lowercase; shift key; uppercase; double ctrl A; caps lock.

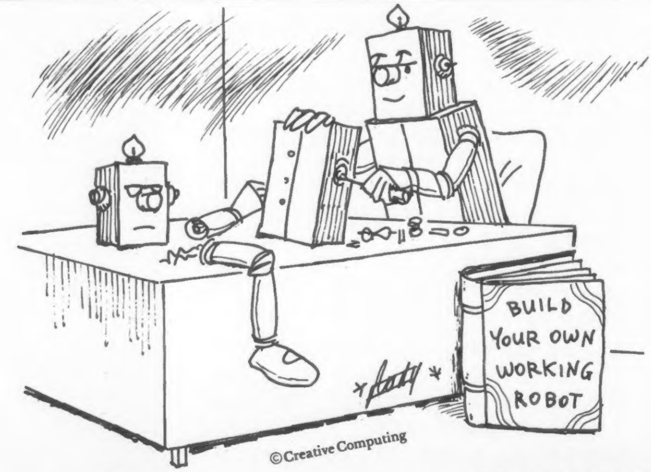
The Sup'r'Terminal does not respond to "Home," "Vtab," etc., but as on the Videx, substitute commands to provide the same functions are given in the manual. DOS and Basic will not respond to lowercase commands.

The 80-column screen does respond to the tab character (ctrl I) by moving the cursor to the next field. Tab fields are 80 characters wide.

We also noted as a handy feature the ability to program the 80-column scrolling window as can be done with the Apple's 40-column output.

We observed a couple of peculiar items with the M&R: when the Sup'r'Terminal is activated, the color of any graphics displayed on the 40-column output deteriorates, and the inverse video mode (black on white) affects only alpha characters, not numerals or symbols.

There are many good reasons for wanting 80 columns on your Apple, and if you are looking for a board to make your Apple "Professional," the chart in Table 1 should help you with your shopping. Be aware though, that product improvements are likely, so check with your dealer before deciding which board is for you. ☐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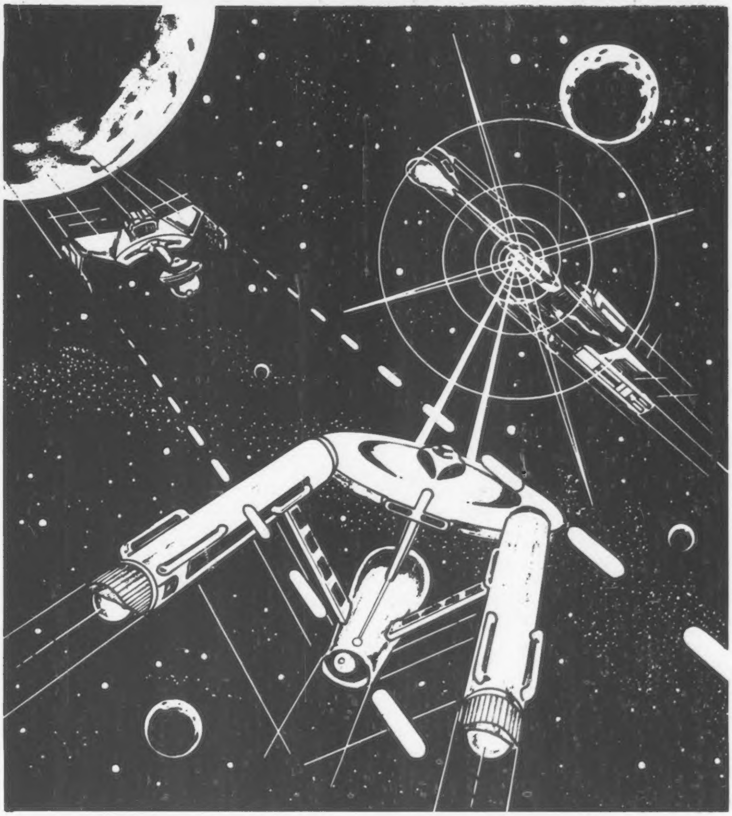

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Each class of vessels is awarded a point value to reflect its relative strength so you can assemble fleets of comparable power for a balanced game. Of course, your're free to play the intrepid hero against seemingly hopeless odds –perhaps mere fighters against a star base!

Employing up to ten ships, both sides can give individual or fleet orders, the latter allowing all your ships to execute your commands in unison.

THE COMPUTER, aside from being the game's perfect administrator and referee, also serves as your ever-ready, ever-capable nemesis in the multiple solitaire scenarios provided: The Reman Chase (replete with the Cloaking Device, Plasma Torpedoes, and Neutral Zone); Attack on Star Base; Attack on Base Station; and Dogfight.

THE TWO-PLAYER VERSION is essentially free-form. With each player choosing starships from a different Empire, you can create scenarios ranging from space skirmishes to a full-scale, all-out star war!

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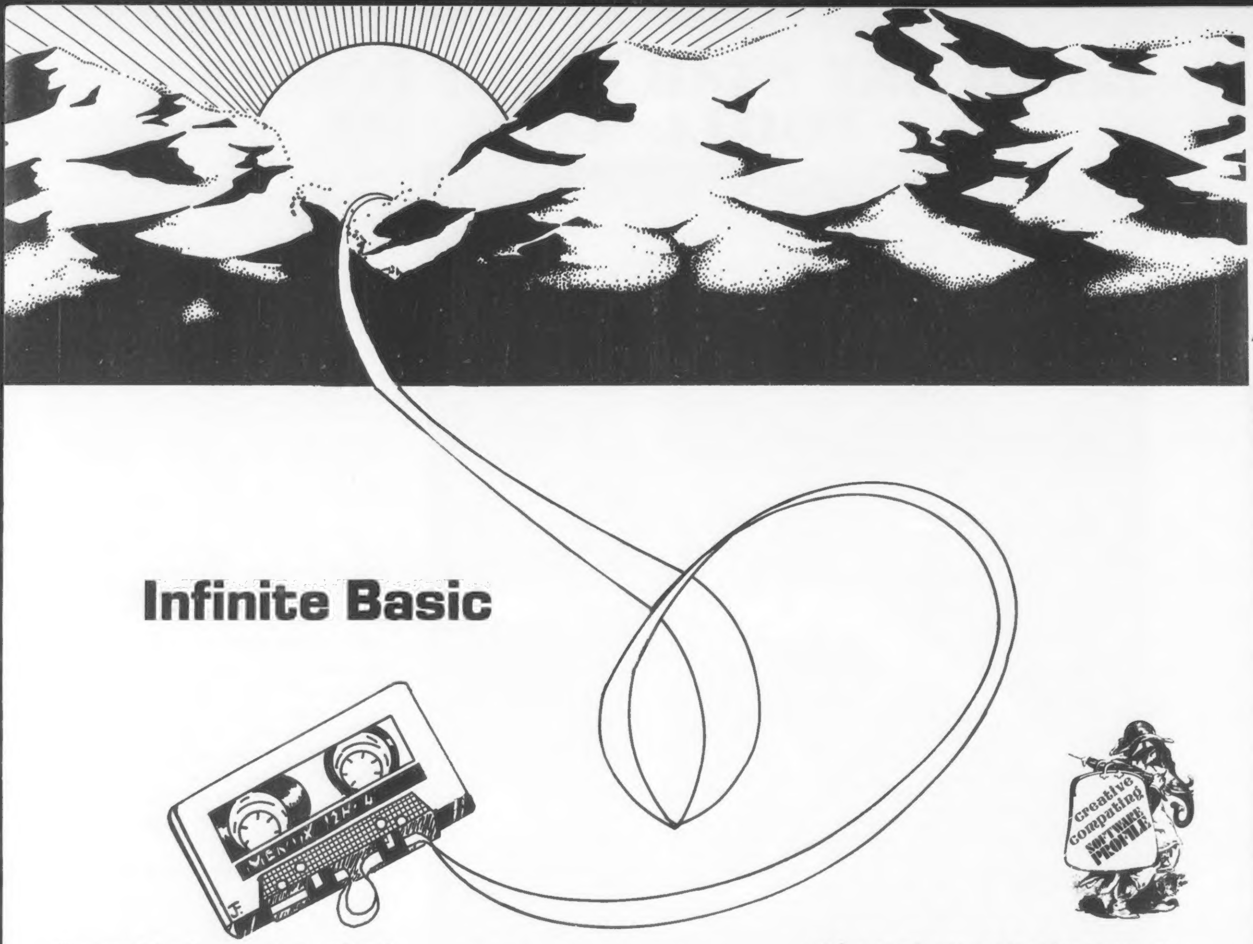

Infinite Basic

April D. Lorenzen

Frustrated by the limitations of Level II Basic? *Infinite Basic* from **Racet Computes** may be your saving grace! Unlike most other enhancements to Level II, *IB* takes up very little memory because you create a specialized load module containing only the function routines necessary for a specific program. The module can be located anywhere in memory and saved on the same tape as your program. The machine language routines are activated by executing a ?USR(1) statement and deactivated by executing the *Infinite Basic* command &NOIB.

Matrix functions include reading or writing arrays to tape without leaders between elements, redimensioning and deleting arrarys with no loss of data, reading data statements into arrays, and copying or transposing one array into another as well as scalar, element, and matrix addition, subtraction, multiplication, division, solutions to simultaneous linear equations, Basic subroutine calling, and subroutine return value facilities are all part of the package and individually selectable.

Extensive string manipulation routines include justify, rotate, shift, and truncate left or right, search a string for a substring, delete or insert a substring, and truncate left or right, search a string for a substring, delete or insert a substring, and the verify routine which compares two strings and returns the location of the first discrepancy. You can also create an absolute string pointer, convert any string or numerical value to a hexadecimal string, perform a character string or multivariable sort, PLUK or PLUG a two byte word into memory, propagate a byte consecutively in memory, and compress or decompress bytes to four, five, six, or seven bit formats.

Infinite Basic allows you to draw and erase horizontal and vertical lines at high speeds and control screen scrolling up, down, left, and right with more handy routines.

Many functions could be used in text editing such as the text pack function which deletes spaces from the ends of strings and leaves words separated by not more than one space. A character other than a blank space can be specified and will be deleted instead. Centering and justifying text, generating random strings, and converting to upper or lower case at will is also possible.

The routines mentioned above and several more are fully explained with program examples in eighty-four pages of excellent documentation. I received my copy of *Infinite Basic* less than two weeks from the day I mailed my order. It comes on a single cassette with the tape version on one side and the disk version on the other. I had no trouble loading it on the first try. The only criticism I have is that the terminology used in the manual may not be familiar to the average TRS-80 programmer. A glossary of terms would be a definite advantage. Perhaps David Lien will write a book entitled *Learning Infinite Basic* for all us novices!

Infinite Basic is easy to use, well documented, has greater capability and executes faster than Basic subroutines in less memory, and appears to have unlimited applications. An add-on module (*Infinite Business*) is available and more modules will be introduced in the future. Both are available for 16K to 48K cassette and disk based TRS-80's at the very reasonable price of $49.95 (*Infinite Basic*) and $29.95 (*Infinite Business*) from Racet Computes, 702 Palmdale, Orange, CA 92665. ☐

April Lorenzen, Route 2 Box 44, Canton, KS 67428

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★★NEW★★
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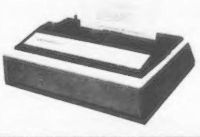

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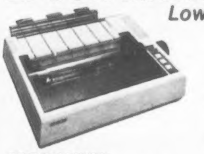

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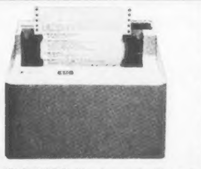

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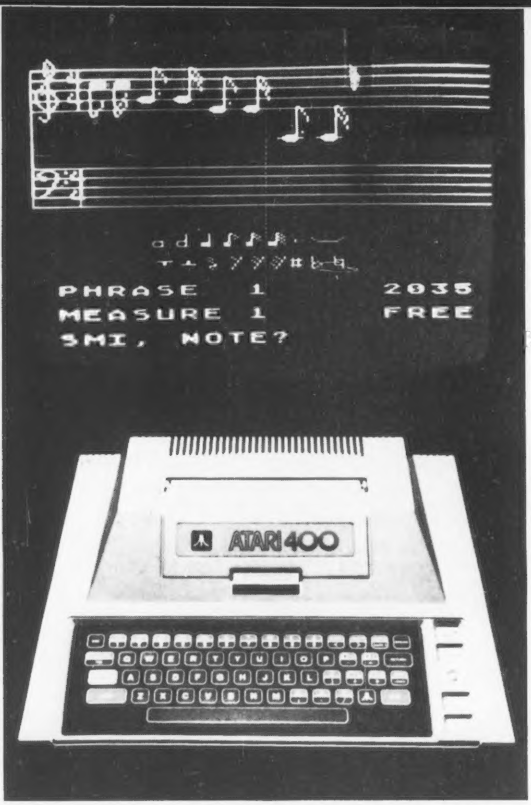
Atari Music Composer



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Karl Zinn and David Zinn

We've been using the Atari Music Composer in home education and some school situations. We would like to share our initial experience and preliminary ideas here, and suggest other things that could be done.

The manual for the Music Composer suggests it can be used to develop skills in listening, perception, music notation, composing (melodies, harmony and counterpoint), musical relationships, and building musical structures from simple parts. We found we could do all these things and more, always in a pleasant and rewarding educational environment. Nearly all of our trials were in a home setting; but some were in a summer class for 8 to 14 year-olds interested in using computers.

For those who know other music boards for small computers (ALF, MicroMusic, MicroTech, Symtek), this one is comparable with five important differences.

1) Nothing extra is needed. The circuitry is built into the Atari and the audio is amplified by the TV set (or monitor) which is used as the display device for the computer. You can also take the audio out of a 5-pin jack on the side of the Atari 800 to feed any other amplifier.

2) Most people will use it as given. Since the Composer software is in ROM it can't be changed. Programs can be written in Basic either to generate data files that can be read by the Composer, or to play the Composer's data files with other tonal characteristics.

3) Use is very straightforward, with most of the options so obvious that a manual is not needed. The user works through menu pages linked in a hierarchical structure, with clear mnemonics and using normal keys for insert, delete and cursor control.

4) The system protects rather well against common user errors. New users, without previous experience with computers, get melodies to play back about as they intended them, and are not likely to lose them accidentally.

5) The user has little or no control over tone quality, attack and decay, crescendo, and the like.

The basic building block is a musical phrase; up to ten can be stored in memory. Phrases are arranged in up to four voices, with dynamics, repetition and transposition specified in a list of statements which looks like a computer program. Indeed, the composition activity can be used to develop programming concepts such as sequencing and iteration. Building a melody and counterpoint from phrases is good practice in music education as well.

Phrases, voices or an entire composition can be saved on tape or disk, and retrieved later, perhaps with new arrangements. We much prefer disk because it is faster, but the cassette was adequate when we put only one data file on the beginning of a tape. (You will have discovered this problem with positioning the tape when reading a file from the middle of a tape if you use cassette on the Atari. We have heard that this software problem in cassette control will be fixed by Atari in a future release of the operating system.)

We already said we hardly needed the manual. This should be true for almost any experienced computer user, and perhaps many novices. We find a five-minute demo to be enough to get anyone started; a few things may not be obvious, such as "FN" as the abbreviation for "File Name" in a prompt, and the prefix "D:" needed to specify that the file is to be retrieved from (or saved on) disk instead of cassette. But the manual is well-organized with clear descriptions and photos of the screen in various states. We recommend it to those who would rather learn systematically than by exploration. One part provides an overall description with things to do; another provides the file structure for those who wish to do things with Basic as well; it includes programs for listing files, composing music, and arranging harmony. A last part summarizes each of the commands.

We have many stories to tell about our use of the Music Composer, and plan to do so in a later article after we have experience with a greater variety of users and in other educational settings. Perhaps you can get an idea from these brief notes: Piano music entered into the Atari was played and displayed by the computer in a regular way which made obvious some syncopation which had been hard for the student to catch and perform otherwise. Some band music was entered so that the cornet player could practice (at home) with the other parts played by the Atari. A band part in the Atari was used as a model (and a metronome) for repeated practice

---

Karl Zinn, University of Michigan, Center for Research on Learning & Teaching, Ann Arbor, MI 48104.

David Zinn, Greenhills School, Ann Arbor, MI.

of a difficult sequence, gradually coming up to the required speed. Music heard only on the air was entered and reviewed (and played for fun), exercising notation, interval recognition, note duration, time signature, key signature and other music components. The pleasure of this activity for kids contrasts with the reluctant response of some students to "dictation" exercises.

Music already stored in the Atari was modified in various ways (e.g., tempo and counterpoint) to change the style. Musical rounds and fugues were explored, pushing the complexity until the sounds were no longer pleasing to the arranger or composer. Timbre (tone quality) was explored by writing parts in unison and then transposing them to various partials (harmonics) one octave away, an octave and a fifth, two octaves, etc. Original compositions were developed by entering familiar melodies in up to ten phrases and rearranging them in interesting ways (such as those compositions of P.D.Q. Bach as discovered by Professor Peter Schickele!)

What we missed most while using the Atari Music Composer is a display of all four voices at once (as on a regular musical score or piano music). Sometimes it is difficult to find the part you wish to modify, since you can look at only one phrase at a time, and one measure in that phrase. Getting everything on the screen at once is a lot to ask of an 8K ROM application cartridge operating with an 8K RAM (yes, all these cartridges work on the 8K Atari 400 as well as our 48K 800) and displayed on an ordinary TV. If it weren't for the lack of resolution in TV rasters Atari might have avoided the problem of where to put the note stems by displaying each voice on a separate staff. Having a printout of the score would be really nice, and get around the TV display limitations.

> ***Use is very straightforward, with most of the options so obvious that a manual is not needed.***

At times we could enter music as chords instead of notes in separate voices. A good composer aid offer many options for entry of music. But being limited to one, entry in phrases and voices is the right one for this beginner's composer. Other advanced aids are also missing: tone quality, envelope (attack and decay), inversion, and other operations on musical patterns. We suspect that some of these can be done from Basic.

Although it is nice to be able to get all of the disk operating system from the Music Composer, working through it all to get a listing of what files are on the disk is a nuisance. One should be able to display the music files on the screen directly, and select one without the computer first erasing all the names. (It takes "D,<RETURN>, A,<RETURN>,RETURN" to get the directory on the screen. To get back requires a <RETURN>which erases the screen and then a "B,<RETURN>" to get back into the Music Composer. The new DOS 2.OS for the Atari simplifies this slightly (fewer returns are required) but one is still limited to what was designed into the Composer ROM.

In summary, although we could ask for more, what is provided was done very well for home education and recreational activities at a simple level. Clearly, some people thought carefully about what should go into the Music Composer to make it helpful in music education. We hope others who find themselves in the position of advising computer companies will also help make the entertainment products better for education.

The Music Composer is available for $59.95 from Atari Inc., 1272 Borregas Ave., Sunnyvale, CA 94086. ☐

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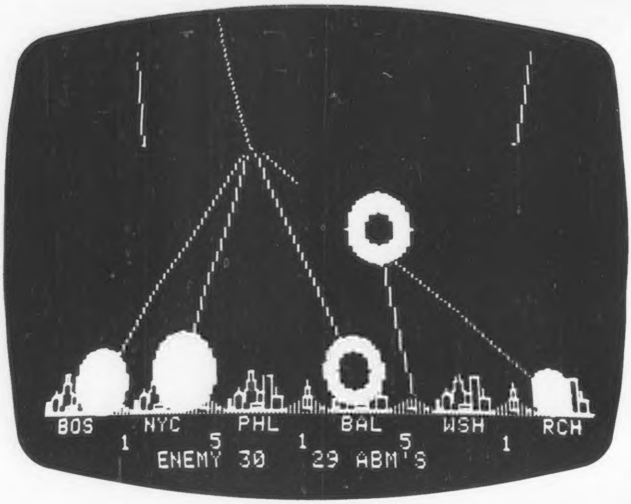

Dadblast it. There I was, solemnly dedicating my day to hard work writing, and the mailman innocently dropped a bomb in my hands. Bah!

The product announcement proclaimed, "Invader and Asteroids move over...ABM has arrived!" So it has. From Muse, 330 N. Charles St., Baltimore, MD 21201. It sells for $24.95 on disk, and requires 32K, Applesoft ROM.

Your goal is to protect the cities of the eastern seaboard from Boston to Richmond against guided missile attacks that stream in from the top of the screen.

You see a green vapor trail begin, if you have color. Control the crosshairs with the game paddles (or I imagine a joystick would be better), and launch either 1- or 5-kiloton anti-ballisic missiles. But you must lead the correct distance: if you miss, the missile streaks on in to explode with a roar and hi-res color graphics.

Some incoming missiles are multiple warhead jobs. That is, they reach a certain point and split into five or six; then those may split into five or six; then those may split yet again. At first, the game is fairly easy. The farther into it you get, however, the more missiles rain down on you.

My 0 paddle is rather worn from playing invader and asteroid games and "Computer Quarterback," so I wasn't able to cover the entire visible screen.

The beginning instructions allow you to calibrate your paddles, but it didn't work on mine. That is, the program didn't adjust for the lack of resistance in the paddle. It did allow me to select the direction in which I wanted to use the two paddles. I ended up with the 0 paddle controlling up and down movement while the 1 controls horizontal moves.

I chose to put the untouchable section at the top of the screen: I can't fire when I first see the missile, after all. I have to wait until I can lead it properly.

Sometimes a fireball will spread to stop other incoming warheads (or your ABMs). I've found the best strategy is to just keep protecting everything as long as possible. When the bombardment gets too heavy, focus on one area and try to protect that until the final explosion goes off.

The game even keeps track of the highest score achieved, lest you stop striving for self-improvement!

This is another arcade game suitable for Archibald's Law: The more you cuss it, the better it is. This monster's *highly* cussable. ☐

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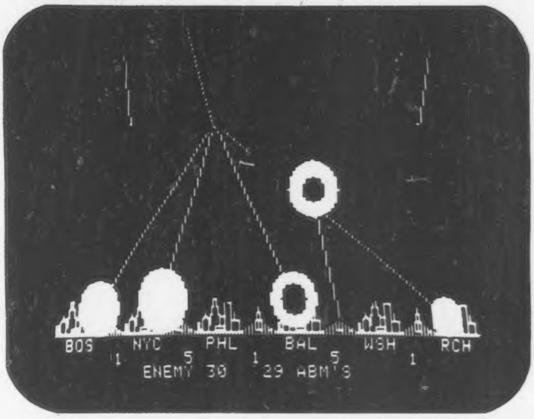
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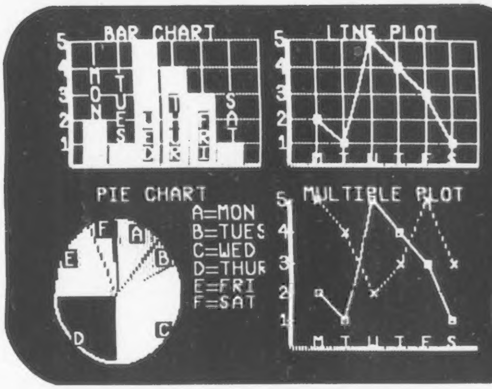
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If you didn't make it to Russia this summer, all is not lost. The Olympics live on in the form of an excellent TRS-80 game. There is also hope for those of you who haven't managed to book passage on the space shuttle. You can engage in a bit of lunatic defense on an Atari. Finally, for those of you who want to know whether you should go to Russia, buy bonds, get married, or undergo any other risky activity, there's a horoscope program for the Apple.

Test Your Medal

Not satisfied with merely providing excellent versions of Basic for home computers, **Microsoft**, 400 108th Ave. N.E., Suite 200, Bellevue, WA 98004, has entered the world of sports. Defying the laws of physics, they've squished all the excitement of Olympic competition into a 32K TRS-80 program. It will fit in 16K if you don't mind making a second load from the cassette in the middle of the game. Simply put, *Decathalon* ($24.95 on tape or disk) is great; the game is exciting and well designed, the graphics are superb, and the price is reasonable. The program opens with clever title graphics, and keeps getting better. Up to eight players can compete in the ten events, or take part in practice sessions. The practice is essential since some of the events require careful timing and coordination. This is not just another number-crunching simulation.

Several examples will suffice to give an idea of the events in *Decathalon*. The javelin begins with a running approach, accomplished by rapidly hitting two keys. (If you have a loose cable, your TRS-80 might respond to the pounding by doing an undesired reset.) At the right time, you have to hit another key which, while depressed, raises the javelin. A fourth key makes the throw. If you wait too long before throwing, you'll cross the line and foul. The excellence of the graphics bears repeating; the athletes depicted are very realistic. In the pole vault, coordination and timing are really put to the test. After choosing the length of your approach and the height of your grip on the pole, you start running. At the right moment, you have to lower the pole so it lands in the pit. Then, once up in the air, you have to do a handstand on the pole at the right moment, then kick off to clear the crossbar. It ain't easy. The results of a bad jump can be both pathetic and funny. In certain instances, the player slides back down the pole, head first.

Between events, the scores and standing of the participants are displayed, adding to the excitement. *Decathalon* also makes a fine solo game. The individual player will always come in first when there is no competition, but there is more involved here than just order of placing. Each event produces a score, and you can play again and again trying to achieve a higher total. I recommend *Decathalon* to anyone who owns a TRS-80.

Still Driving Them Crazy

Atari, Inc., P.O. Box 427, Sunnyvale, CA 94086 has introduced *Space Invaders* for their model 800 and 400 home computers. This version is different from the familiar arcade version, but similar to the Atari Video Computer System cartridge. Designed for one or two players, the game comes with twelve options, which vary in such factors as the number of lives you get, the speed of the missiles, and whether or not the missiles are attracted to your ship. Rather than appearing in full rows on the screen, the aliens come in columns from a rocket at the right of the screen. If you manage to shoot all of them, the rocket moves a bit closer and a new set appears. If you get enough sets to bring the rocket all the way to the ground, a surprise graphic piece of humor occurs.

In the one-player version, the field remains the same when you are shot, allowing you to continue where you left off during any game. In the two-player mode, the field resets to the start at the beginning of any turn. In other words, you always start out at the same place.

It's nice to see Atari releasing a popular game on tape instead of ROM, thus making it a bit easier on the wallet. One warning; don't play the game within a half hour of the time you need to do anything with your hands. They just won't be able to function for a while after gripping the joystick in a frenzied clutch.

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Soft Centered, continued...

Starry Night

Astro-Scope ($30.00) is a disk-based program for a 32K Apple with ROM Applesoft or 32K TRS-80 with Disk Basic 2.3, from **Astro-Graphics Services, Inc.**, Box 28, Orleans, MA 02653. As the title implies, the program produces complete horoscopes, giving all the required data for the positions of the sun, moon, and planets. This is followed by a mass of text describing the personality and traits of the individual in relation to each aspect of the horoscope.

I will leave any arguments for or against astrology alone, and deal only with the program as a piece of software. On the bad side, the input routines show a fair amount of laziness. Any error during input will throw you to the top of the input loop, requiring that all information be re-entered. Also, input data are separated in all cases by commas. For instance, the date 1/15/55 must be entered as 1,15,1955, and the time 3:30 must be entered as 3,30. This shows an interest in making things as easy as possible for the programmer with less concern for the user.

Once the data (time and date of birth, latitude and longitude of birthplace, and time zone) are entered, the program takes about a minute to calculate the horoscope; not bad considering all the computations involved. The documentation gets high marks. It includes information that will aid in determining time zones, latitude, and longitude. It also explains the meaning of many astrological terms and tells how to get the most benefit from the program.

It's interesting to note that everyone watching the program, whether a skeptic or believer, wanted to try it. This seems to indicate that, beyond being useful to those interested in astrology, the program might be fun at parties. AGS software also produces *Sex-O-Scope*, a similar program which deals with a person's sexual tendencies and attitudes as influenced by the stars. Discounting the poor input routines, *Astro-scope* is probably the most comprehensive and interesting astrology program available.

Feedback

A few months ago, I asked for thoughts on the subject of protected software. Bruce Oakes of Lebanon NJ was kind enough to respond with some interesting ideas. He raises an important point: many home computer owners don't just play the games they buy, they also learn from them. Obviously, if you can't list a program, you can't learn from it. On the other hand, I believe that a programmer who has developed a unique technique probably deserves some protection for his ideas. This seems to bring us to a dilemma which can be alleviated by another point Mr. Oakes mentions. Thorough documentation encourages individual purchasing. Perhaps protected software could be furnished with documentation that explains some of the techniques used in the program. While it might seem unfair to expect software vendors to take the role of teachers, this approach deserves consideration. There are already programs on the market that include extensive tutorial documentation. I would imagine such packages suffer a low rate of piracy.

Is it unfair to expect vendors to provide software from which you can learn? Does documentation limit piracy? Is there any solution that will suit both suppliers and users? Let me hear from you. ☐

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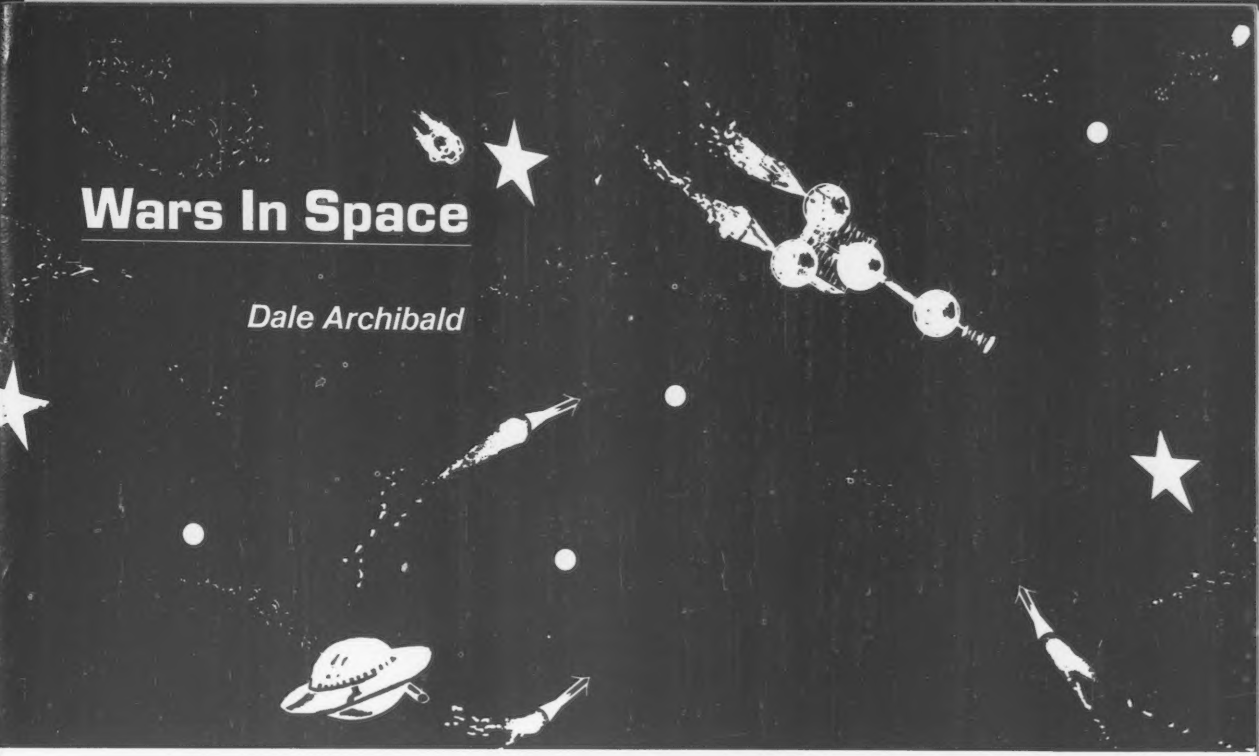

Wars In Space

Dale Archibald

I enjoy space programs—and I don't mean N.A.S.A. or Buck Rogers. I admit part of the reason is that such flights of fancy feel so appropriate played on a home computer. Thus they're fun for several reasons, not the least of which is knowing such enjoyment would have been unavailable to me just five years ago.

Of course I'm referring to the games that use outer space as the background, from arcade shoot'em-ups to the new space strategy gems. Galaxy (P.O. Box 22072, San Diego, CA 92122) and Broderbund Software (Box 3266, Eugene, OR 97403) both offer good strategic space games.

I don't have a color monitor or TV set yet, even though most of the newer games for 48K Apple II Plus use high resolution color graphics. I'm sure I miss a lot of vibrancy, but most of the time color isn't essential.

I say most of the time, because in **Galaxy Space War 1**, if it isn't essential it sure is handy. Frank Tarkeny spent 11 months working on this game, and it was time well spent.

War 1 is a strategy game on disk for the 48K Apple II with Applesoft in ROM, or the Apple II Plus. It can be played solitaire, or by two people. It seems there is a war raging between opposing galaxies, the red and the green, each of which has a certain amount of energy and a certain number of building blocks with which to build a fleet.

Two modes of play are available. One mode allows total knowledge: that is, the player can see all ships of both fleets, and their placement on the 17x33 sector grid.

More interesting is the "sensor knowledge" mode. Using this, the opposing craft aren't seen until—and here's where color is necessary—they're within sensor range. At that point, the four dots at the affected corners of the sector turn violet. So sensor knowledge allows the opponents to play blind until something blunders close. This is a fine example of what wargamers call "fog of war"; that is, in the confusion of combat, it isn't always possible to see and know everything that's happening on a battlefield. A computer is ideal for simulating this.

Play begins with shipbuilding. Ships are built by selecting the size, shape, and total energy. Each is designed according to individual taste, as long as the blocks—each filling a sector—touch one another. Each combatant can have a fleet of up to 26 ships, composed of from one to nine blocks, with between 100 and 999 energy units.

The instructions take up six pages and a summary sheet. They're a bit convoluted, but understandable after several readings.

For instance, the total energy a ship has is divided into quarters, each of which is allocated either to screen/detection or attack/move. Thus, if screens are set at 0 (zero per cent) detection is also set at 0, but the ship can move 4 sectors (doubled with hypermove) and/or attack with beams as far as 4 sectors away. If the screens are set at 4 (100 per cent), a ship can detect an enemy up to 4 sectors away, but can neither move nor attack.

If screen/detection is set at 1 (25 per cent), that leaves 3 sectors to move and/or attack. Each move costs attack energy points, one point for a one-sector move, two for a hypermove.

Screens can be changed at any time, but after that the ship can only attack until the end of that move. A ship with half its energy allocated to screen/detect could move up to 4 sectors (on hypermove), change its screen from 2 to 0, and attack up to 4 sectors away.

During an attack, the screen energy of the prey is first affected on a one-to-one basis; its attack energy is drained two units for every unit with which you attack. For example, if a defending ship has 100 energy units divided between screens and attack energy, you would expend 50 units to burst the screens and 25 to drain its attack energy.

Two other unusual features are the Plan Battle command and the Kill. Plan Battle gives the attacker a readout on the amount of power needed to destroy a defender with screens at the various settings. Kill lets a player clear the screen of the energy-drained husks of ships. There's also a Save Game feature.

When two players are battling each other, there are some shortcomings. First, whichever player is at the computer can attack without his opponent knowing which ship was hit until he returns to the keyboard. There is no defense except having screens on full. Then, too, a player can find out—by calling up the Galaxy summaries—how his fleet compares to the opponent's in

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Dale Archibald, 1817 Third Ave. N., Minneapolis, MN 55405.

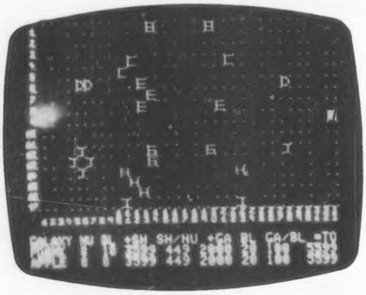
Wars In Space, continued...

terms of number of ships, blocks used, power, etc. (My opponent and I agreed not to look at that report or one another's ship reports.) The best strategy on the games I've played so far seems to be a very conservative one. That is, let your opponent use energy moving toward your galaxy. Then strike!

The Galactic Saga line put out by Broderbund is a whole new concept in games, different from any I've seen until now. They consist of **Galactic Empire, Galactic Trader,** and **Galactic Revolution**. The fourth, **Tawala's Last Redoubt**, is in the works. All programs are by Douglas G. Carlston, and they're very good. All are available for the TRS-80 Level II 16K on cassette, 32K disk, and on disk for the 48K Apple II Plus, or Apple II with Applesoft in ROM.

Your mission is to conquer and hold the 20 inhabited worlds of the system.

The story begins with you in command of Galactica's Imperial Forces. Your mission is to conquer and hold the 20 inhabited worlds of the system. Some worlds are primitive; others are equal in sophistication to Galactica, but many have larger or smaller populations; yet others may be technologically more advanced. You have 1,000 years to accomplish your mission.



Galaxy War I

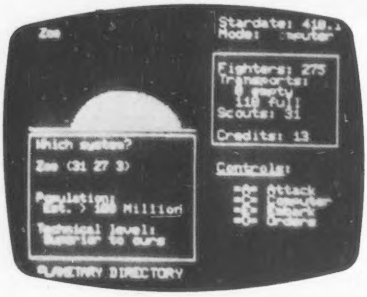
When you begin, you only have information about one planet: Galactica. You must order Lieutenant Starbuck to send out scouts to investigate the other planets and return. Their reports will bring your computer up-to-date on their status. (That can change over the years, remember.)

Computer Central will give you star maps of the local area and the galaxy, plus a rangefinder for the light years between two stars. If you'd rather have the planetary directory, that will relate information about the planets from which probes have returned. Status reports tell you when and where probes will return, or when fighters, transports, or probes you've ordered are due to arrive, and where.

Besides Starbuck, other officers are Navigator Kirman, Lieutenant Bayliss (responsible for taxation, enlistments, and ordering ships), and Doctor Henderson (quick with a sleep needle).

The sound and graphics are good, albeit simple. The planets appear and disappear, star trails move toward you as your fleet travels through space. The battle scenes are simply readouts of the odds of winning.

The entire game is one of logistics. First conquer weak planets near Galactica, then tax them to build your forces back up. Primitive planets can only supply troops, while more advanced planets can supply ships as well. You're forced to shuttle back and forth between the occupied planets to collect taxes (once per visit), buy ships, and enlist troops. When you're ready, you go on to the next target, and, upon arrival, attack. Depending upon circumstances, you either win or retreat when the odds are bad.



```
Zoe                          Stardate: 418.1
                             Mode:   computer

                             Fighters: 275
                             Transports:
                               0 empty
                               110 full
                             Scouts: 31

Which system?                Credits: 13

Zoe (31 27 3)                Controls:

Population:                    =A= Attack
 Est. > 100 Million            =C= Computer
                               =R= Report
Technical level:               =O= Orders
 Superior to ours
PLANETARY DIRECTORY
```

Galactic Empire

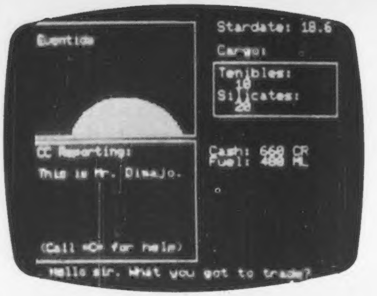
As you expand the empire, you can gather more taxes to build more ships. Time, however, is not always on your side. After all, the galaxy takes 60 years to cross and there are 19 planets to conquer.

Careful planning is the key to winning the game. Patience, too, is important. Each move deducts time from the 1,000 years you have. When you are not traveling or in suspended animation a year takes four minutes.)

The game runs quite a while. It's lucky there's a Save Game feature.

I wish there were a Save Game on **Galactic Trader** and **Galactic Revolution**. In **Galactic Trader**, the Emperor Tawala Mungo has removed you from your command. He has also, it is rumored, set assassins on your trail.

Computer Central has stayed true to you, as has your navigator, Kirman. Now you begin with a ship, 1,000 credits and 1,000 millits of fuel.



```
Eventide                      Stardate: 18.6

                              Cargo:
                              Tenibles:
                                10
                              Silicates:
                                20

CC Reporting:                 Cash: 668 CR
This is Mr. Dimajo.           Fuel: 488 ML


(Call =C= for help)
 Hello sir. What you got to trade?
```

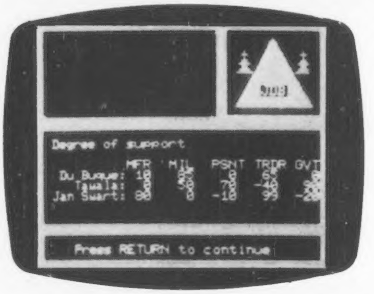
Galactic Trader

Unfortunately, you don't know where products originate, where they're most valuable, or the rates of barter (no trader will accept coin except on Galactica). By slow, cautious trading, you try to amass a fortune. Never retrace your steps, however, because if one of the trading companies discovers you've found a profitable route, it will steal it from you.

Every time you return to Galactica, by the way, the chances are better an assassin will earn blood money.

Computer Central will help you with star maps, trading records, and fuel use computations. You feed in the amount of cargo you have and where you want to go, and the computer shows how much fuel it will require. If you're forced to buy from the fuel cartel, however, you'll only get about half-price for your goods. You don't want to end up lost in space. You also don't want to make an error on a transaction with a trader. The results are very messy.

Last is **Galactic Revolution**. By the time this scenario begins, you've made your fortune. Tawala Mungo has pretty well hashed up the Empire you earned for him and now you feel the time is right to make your move. Unfortunately, despite his cruelty, he still has a great deal of support from the peasantry, almost all the bureaucracy, and half the military.



```
Degree of support

            MFR  MIL  PSNT  TRDR  GVT
 Du Buque:   10   85     0    65    0
   Tawala:    0   50    70   -40   80
Jan Swart:   80    0   -10    99  -20

   Press RETURN to continue
```

Galactic Revolution

In additon to Tawala, you are faced with the trader leader, Jan Swart. His constituency is strong among manufacturers and traders, but he is disliked by peasants and bureaucrats both.

Your only advantage is that no one hates you. You also have strong support from the military, and some from the traders.

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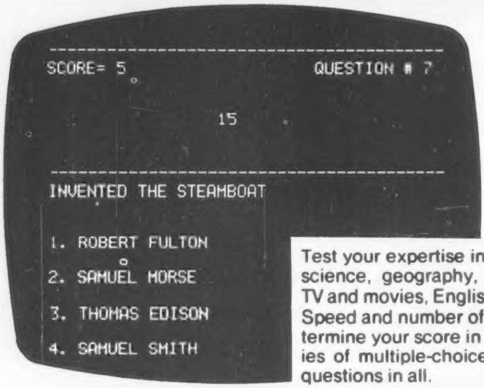

```
SCORE= 5                    QUESTION # 7

                  15

INVENTED THE STEAMBOAT

1. ROBERT FULTON

2. SAMUEL MORSE

3. THOMAS EDISON

4. SAMUEL SMITH
```

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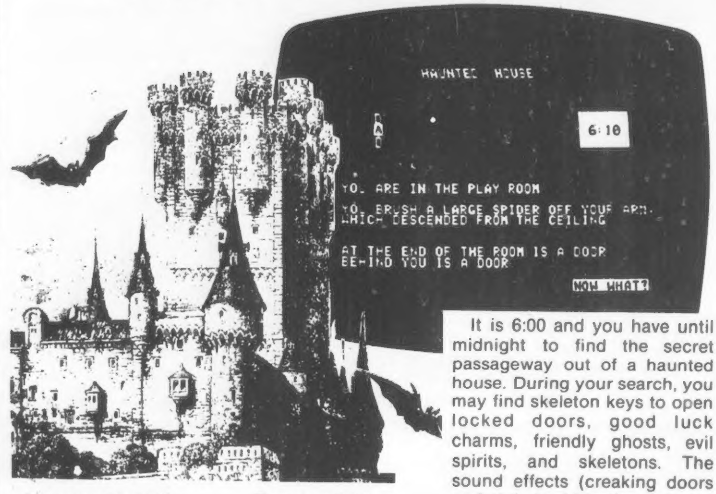
Haunted House



```
HAUNTED HOUSE

                                  6:10

YOU ARE IN THE PLAY ROOM

YOU BRUSH A LARGE SPIDER OFF YOUR ARM.
WHICH DESCENDED FROM THE CEILING

AT THE END OF THE ROOM IS A DOOR
BEHIND YOU IS A DOOR

                                  NOW WHAT?
```

It is 6:00 and you have until midnight to find the secret passageway out of a haunted house. During your search, you may find skeleton keys to open locked doors, good luck charms, friendly ghosts, evil spirits, and skeletons. The sound effects (creaking doors and stairs) add to the eeriness. The house layout changes in every game.

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Every planet has five power groups: manufacturers, military, peasants, traders, and bureaucrats. In the solitaire game, there are no alliances. In the two and three player games, there can be alliances. There can also be blockades against planets to prevent taxation by an opponent if you make the wrong diplomatic moves, and force it away from your camp. In some cases, you might even want to declare war as a last resort.

When the game starts, there are seven independent planets, each with a different power structure. Each character also has a power base, with varying numbers of planets, troops, arms, and ships.

The key to winning a planet is administrative action. You may implement land reform or collectivize farm and factory; reduce or increase tariffs; institute univeral conscription or abolish the draft; or take any of four other actions. Each action will strengthen one or two groups and weaken others.

Tawala, for instance, might increase tariffs because it would weaken traders. He might lose some points among the peasants because imported goods would cost more, but it would increase his popularity among the manufacturers and give more strength to the bureaucracy that would be collecting the taxes.

DuBuque, the hero, might choose universal conscription on one planet because it would strengthen the military, which is strongly for him, and at the same time weaken both the peasantry and the traders (they're fine pilots).

This is a great wheeler-dealer game, with enough twists and turns to delight Machiavelli. The witty instruction book outlines strategies such as the Straw Man Maneuver, e.g. taking administrative actions to throw a planet to a very weak opponent, then declaring war against it. Win the planet back, change the administrative actions back—you're more popular than ever, and have "new credentials as a war hero."

How do you win? As Gary Carlston writes in the manual, "Well, you win if you get control of all 18 worlds. You'll even get a score, based on the amount of time it took you to take control and the resources you preserved at the end. No bells and whistles though. Winning isn't everything." If only it would Save Game. ☐

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Address ______
City ______ State ______ Zip ______
Occupation ______ Age ______
Intended use of ZX80 ______
Have you ever used a computer? ☐ Yes ☐ No Do you own another personal computer? ☐ Yes ☐ No
CC-4-1

The Ultimate Connection

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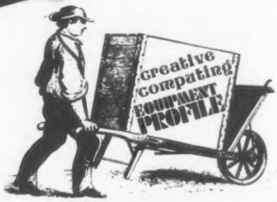

No, it wasn't love at the first sight, but after a few days with the Microconnection, it became a realistic and real affair. This is an unbiased evaluation of the Microconnection from the Microperipheral People for which I also relied upon CompuServe's Information service (formerly called MicroNet).

The basic computer arrangement used for the review, consisted of the TRS-80 computer, Level II with 48K of RAM, three disk drives, Microline 80 and IP-125 printers, using at various times TRSDOS 2.2 and 2.3, followed by NEWDOS+ and the latest, most powerful NEWDOS 80 from Apparat, Inc.

For providing maximum support in computer communication for the hobbyist and general computerist, CompuServe Information Service (whose Director of Application Software, Mike Ward, was most understanding of my immediate needs and quickly supplied a special evaluation ID number) deserves all the thanks of the author.

The Microconnection allows telecommunication for all TRS-80 computers, be it a $495 Level I, a Level II, or the new Model III. No interface is actually required for the connection to CompuServe, Forum 80, or most other community bulletin boards. The Microconnection also has a serial I/O for a lineprinter.

A serial I/O socket (female DB25) protrudes from the back of the Microconnection along with other screw-terminal I/O arrangements, which permit the use of Ham communications or a tape recorder. Simplex/duplex mode is selectable at 300 or 110 baud. The basic package measures approximately 7.5" x 4" x 2". A cabled modular phone plug of approximately six feet is provided, allowing connection to your modular phone master box. Another wire connects to the power transformer, which is of sufficient watt rating to eliminate any possibility of overheating or other overload problems.

Two LEDs protrude from the top of the instrument package, one to indicate power-on condition and the other to indicate when the carrier has been established. Artwork describes the arrangements for voice/data and simplex/duplex modes, which are selected by two on/off front switches. The 40-pin ribbon connector to the TRS port comes from the front of the Microconnection. The author feels that this is a poor design as the connector cable must be bent at an angle, and causes wear and tear on the ribbon cable.

Upon mentioning the above point in a recent conversation with the Microperipheral Corporation V.P. Don Stoner, I was advised that design changes have located the 40-pin connector port on the side, nicely blending in the cable connect functions. These units should be available soon.

The Micro connection allows computer-to-computer communication over Ma Bell's wires, the transmission of electronic mail in the form of letters and messages, others), stock market data, news, bank services, main-frame computer networks, and also the ability to program in other computer languages. You can also swap programs over the phone, transmit data over Ham radio stations, and make TRS-80-to-TRS-80 communications if the other TRS-80 also has a modem—a heck of a lot of ability for a $495 Level I computer!

Frank H. Marz, Rt. 4, Box 1, Delavan, WI 53115.

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SPEED (Seconds to load "Blackjack")	56	6 (5' wafer)	6½
CAPACITY (thousands of bytes)	38 (C-20)	64 (75' wafer)	59 (TRSDOS)
RELIABILITY (Designed for digital data?)	NO	YES	YES
SYSTEM COST (First unit plus interface)	$60	$250	$800
MEDIA COST (in quantities of ten)	$3.10 cassette	$3.00 wafer	$3.20 disk

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Announcing "Hellfire Warrior", a fantastic new Dunjonquest™ computer game... that's really not for everybody: Beginners are likely to be gobbled up in the first room...and there are over 200 rooms on four levels

"Hellfire Warrior." Really not for everybody: newcomers to Dunjonquest should begin with something easier. Here the monsters are deadlier, the labyrinths more difficult, the levels far more challenging...

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CIRCLE 110 ON READER SERVICE CARD

Ultimate Connection, continued...

With the $249 Microconnection, a dumb (S-80) tape terminal program is supplied, which provides immediate access to a community bulletin board, time-sharing network, and the various networks available, one of which is CompuServe Information Service. Basically the program is dumb, but its simplicity and reliability make it perfect for the new addict to telecommunications. Once loaded under the SYSTEM command, only one question must be answered, which is to select half or full mode (simplex/duplex). When this information is given, a prompt is displayed and you are ready to communicate with the outside world.

For disk owners, the program can be transferred from tape to disk with the Tapedisk command. Use the following Tapedisk data to transfer to disk, assuming you use drive zero (0): F S80/CMD:0 6000 6209 6000. One note of caution, however: the S-80 terminal program will not always work with NEWDOS80, so use TRSDOS 2.2 or 2.3 or NEWDOS+. No tests were conducted with VTOS or other DOSes.

The supplied Manual 1.0 can satisfy most computerists, but certain sections could or should have been written with the beginner in mind. For instance, in the section 'The RS-232 connection' it is mentioned that generally only pins 2 and 7 of the DB25 connector need to be connected to ensure serial interface to a printer. While the use of the printer manual is suggested, carefully check before you make any permanent connections. It would be very desirable to have a detailed circuit diagram of the Microconnection. 'Making the micro connection,' paragraph 2, doesn't apply to many of the telephones sold at various stores. The author's phone, for instance, is barely audible if not connected to Ma Bell's umbilical cord, and no keying tone change is noticed.

If you follow the instructions in the manual, no unpleasant surprises should result.

Enough said about how to hook the Microconnection to the telephone terminals. Various stores have a selection of plugs for standard (old) terminals, not so old 4-pin plugs and converters, with which you can emulate your proper phone installation. Just inform Mama Bell that you have connected the Microconnection, ringer value 0.0. No charges can be rendered by Mama, except if you ask her to install a terminal jack should you lack the ability to do it yourself. You will be charged installation cost and a monthly jack fee. If you follow the instructions in the manual, no unpleasant surprises should result, as tone frequencies are permanently locked in.

A few pages in the manual list networks which can be accessed using the Microconnection. At the conclusion of this article, a list of active community bulletin boards and their phone numbers is given. Access is immediate and free—not counting Ma Bell's charge.

Based on the experience the author gained from using the Microconnection for many hours (phone bills are the best proof) only one aggravating problem exists: for all practical purposes, the most unsophisticated part supplied with the unit. The ribbon cable connect should be terminated with more suitable connectors of the more gentle springy type.

The connectors supplied with the author's unit are pressure-type, contact-to-contact devices, which means that every time you have to disconnect, you must yank on the cable itself. The connectors expand when pushed onto the PC board's mating connection, then their plastic memory permits them to return to their natural molded position, i.e. they seem to be welded to the PC board terminators. While this may be permissible under normal circumstances, the author's residence in the Dairy State includes murky, humid weather conditions. Under the slightest humidity, the connection between the Microconnection and the computer will deteriorate, oxide will form, and the reliability of an otherwise perfect connection will suffer. I am assured that the Microperipheral People, who created an otherwise sound product, will not stake their reputation on a troublesome connector cable.

It is the author's opinion that the Microconnection is of great value for the communication-minded computerist. For reasons of quality, simplicity and useability, the unit can be recommended without any hesitation. Constant use by the author over many hours did not produce a single problem with either the TRS-80 or the networks. Affordability should also be mentioned: $249 with a dumb terminal program, and $299 with an intelligent program and all the other goodies thrown in.

It must be remembered, however, that Terminal programs specifically written for a standard TRS-80 setup (RS-232 interface, acoustical modem), will not work with the Microconnection, nor will CompuServe's Loader program (to retrieve the Executive Terminal program), if you selected CompuServe as your data base. While this may not be a consequential matter (many good Terminal programs exist for the Microconnection), it is worth mentioning. For the electronically inclined, Radio Shack uses ports 240-241 for data and status, whereas ports 208 and 209 are used by the Microconnection for the same purpose.

Once you're ready to communicate over the phone systems using your computer and the Microconnection, you can access networks with such services as the latest news, stock market results, banking service and credit card service with instant card verification.

Using the Network

With the data/voice switch in the out position (voice), dial the phone number which has been assigned by your network. You will hear the dial tone, then the connect tone. When this occurs, push the VOICE switch on the Unit into the DATA position, and the carrier-LED will come on. Hang up the phone,—don't worry, you're connected. A few seconds later you will be questioned about your ID number or assigned code. All the information will be displayed on the screen. If a printer is connected, and you used the code for printer activation (as prescribed in your terminal program), all your communications will result in hardcopy. The nice thing is that the Microconnection provides a serial port for a lineprinter, so even the TRS-80 Level I computer can use a printer without any interface or other optional gadgets. Type in your number or whatever information you are asked to supply. Figure 1 shows sample pages from Compuserve.

The Microconnection provides a serial port for a lineprinter.

```
      CompuServe Information Service
On at xx-xx-xx     XX:XX (Date and EDT)
CompuServe             Page 2
1 News, Weather, Sports
2 Finance
3 Entertainment
4 Electronic Mail
5 CompuServe User Information
6 Special Services

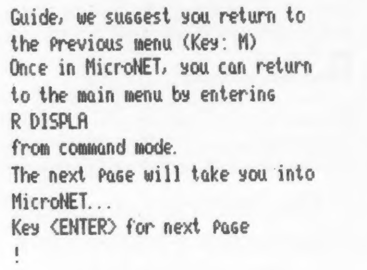

9 MicroNET

Enter your selection number
Or HELP for more information:
!
```

Let's assume you selected 9 MicroNET, CompuServe's personal computing component. The following text will appear on your screen after your selection:

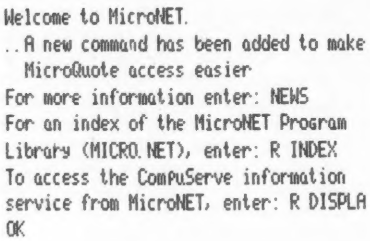
```
CompuServe           Page 25
If you proceed to the next page,
you will enter MicroNET. If you
don't have a MicroNET User's
```

Ultimate Connection, continued...



```
Guide, we suggest you return to
the previous menu (Key: M)
Once in MicroNET, you can return
to the main menu by entering
R DISPLA
from command mode.
The next page will take you into
MicroNET...
Key <ENTER> for next page
!
```

(you just press ENTER)



```
Welcome to MicroNET.
..A new command has been added to make
  MicroQuote access easier
For more information enter: NEWS
For an index of the MicroNET Program
Library (MICRO.NET), enter: R INDEX
To access the CompuServe information
service from MicroNET, enter: R DISPLA
OK
```

From then on you select your choice from the information center residing within the network. Obviously it would be easy to write page upon page of how to, when to, and for what reason to access CompuServe or any other network or bulletin board, but those choices are up to you. As far as the author is concerned, the MicroNet component provides an excellent choice of services. Their rates are excellent.

If you have the Microconnection, the Micro Peripheral People have a new program, The Dow Jones Connection, with which you can access Dow Jones & Company. It allows you to organize your stock portfolio, and update via the Dow Jones computer in Princeton, NJ.

Available Services

Telenet carries only digital telephone line signals but should be explored by the small entrepreneur. General Electric Information Services have tremendous MARK II data bases. The Micro Peripheral People have a software package called 'Mailgram Connection,' which allows you to send telegrams via your computer to U.S. and foreign recipients.

Another useful service is the Telex Connection which uses Databridge, a service of ITT. By using the Microconnection and your computer, you connect to ITT's Telex message center.

Yet another service is provided by the Peripheral People: If you access CompuServe or the Source with the micro connection, you may also access their network-within-a-network. Once you have purchased their product they automatically initiate you into The Microconnection Users Group. It provides the latest information on the Microconnection itself, hardware and software; the Microconnection Owners Bulletin and message center. This is free with the compliments of The Peripheral People. You can leave messages, retrieve messages, and download written programs (record these on your own tape recorder) via the Bell wires. This in itself will justify part of the Microconnection's purchase price.

The latest update on the manual includes terminal programs and other utilities. All in all, the author is impressed with The Peripheral People's interest in supplying a reliable product within the price range of the average computerist, and with their dedication in giving the purchaser additional and free services once he is connected.

The following are addresses of companies and services mentioned in this article:

The Peripheral People
P.O. Box 524
Mercer Island, WA 98040

Computer Information Service
CompuServe Inc.
5000 Arlington Centre Blvd.
Columbus, OH 43220

The Source
Telecomputing Corp. of America
1616 Anderson Rd.
MacLean, VA 20102

Telenet Communication Corp.
8330 Old Courthouse Rd.
Vienna, VA 22180

General Electric Information Services
401 N. Washington St.
Rockville, MD 20850

For listings of data bases contact:
Cuadra Associates
1523 6th St. Suite 12
Santa Monica, CA 90401 □

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  - Print a file while editing another
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- Override commands at run-time
  - Give any command from the keyboard as well as in file
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  - Change pitch in mid-line, even mid-word
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  - String, numeric or dollar format
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  - Any command may be conditional
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CIRCLE 235 ON READER SERVICE CARD

...dateline : tomorrow...

David H. Ahl

IS THERE AN IBM IN YOUR FUTURE?

Two low-end computer systems from IBM are rumored to be already in the manufacturing stage in a Raleigh, NC facility. One system is aimed squarely at the home information system market (games, teleshopping, bank-at-home, etc.). IBM sees this market at 20 million households (one quarter of the total 80 million) with less than 1% penetration today. Target price of their product is under $900 including printer.

A second product is aimed at the very small business market including professionals (lawyers, doctors etc.). A line of "smart" user-programmable terminals are planned for departments of larger companies. IBM is specifically avoiding stand-alone small systems for these users--no point in upsetting the corporate DPers who buy the monsters.

OSBORNE OVERLY OPTIMISTIC?

The Osborne I described elsewhere on these pages promises everything to everybody. The features are impressive--Z-80, 64K, IEEE 488 and RS232 interfaces, modem electronics, 5" CRT, dual 5" floppy drives--all in a package which will fit under an airline seat. Lots of software too--CP/M, CBasic, WordStar, Mail/Merge and a VisiCalc-like package. All this for $1495. Not only that, but dealer margins are quoted in the 40% to 50% range.

Vantage Research thinks it sounds too good to be true. At a 50% margin that means a $750 out-the-door price. With a skimpy 2X markup, that dictates a $375 fully burdened manufacturing cost. Sounds overly optimistic for a unit with two floppy drives, CRT, full keyboard, 64K, carrying case, software and documentation.

Apparently Osborne had second thoughts about the $1495 price too. The projected retail price was upped in February to $1765.

MATTEL KEYBOARD UNIT--LATE AND EXPENSIVE

After much delay, Mattel has announced a $700 retail price tag for its Intellivision keyboard module. Coupled with the $300 price for the master (games) component, this brings the system price to $1000.

"They snatched defeat out of the jaws of victory," said Charles Weddington, president of High Technology, in regard to the price. Two major retail chains of stores indicated that the price was excessive and they would not handle the unit.

This pricing news follows close on the heels of yet another delivery slippage to April or May 1981 for the keyboard. Both Intellivision units were originally scheduled for introduction in October 1979. The game component finally reached some stores in February 1980. The keyboard was rescheduled for introduction in July 1980, then slipped to January 1981 and finally put into a test market in Fresno, California in February.

APPLE PRICES UP TOO

As of February, Apple computer raised prices of all Apple II and Apple II Plus systems by $145. New prices are $1530 for a 48K unit, $1430 for 32K and $1330 for 16K. The old prices were $1395, $1295 and $1195 respectively. The Silentype printer was raised $40 and disk drives $30.

Not only that, but by altering margins, Apple is trying to discourage dealers from selling 16K units and adding "foreign" memory. The margin on the 48K unit is now 35% compared to only 29% on the 16K unit. The message is clear: Apple wants to sell only 48K units made 100% by Apple

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- SuperScribe has a built-in instruction capability such that if you forget how to use a command and the manual is not close by - you may simply ask SuperScribe!
- Supports multiple disk drives!
- Will support alternate character sets.
- Produces form letters using address files easily!
- Supports the shift key modification if made to your Apple.
- Lets you work with your text on a screen at a time basis - reducing typos and allowing you to see your document as you edit it.
- Works with any printer!
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SuperScribe is 100% machine language and requires only a 48K Apple II or II Plus with a disk drive. It may be purchased through your local computer store or direct from us by sending $89.95 plus $2.50 to cover shipping to:

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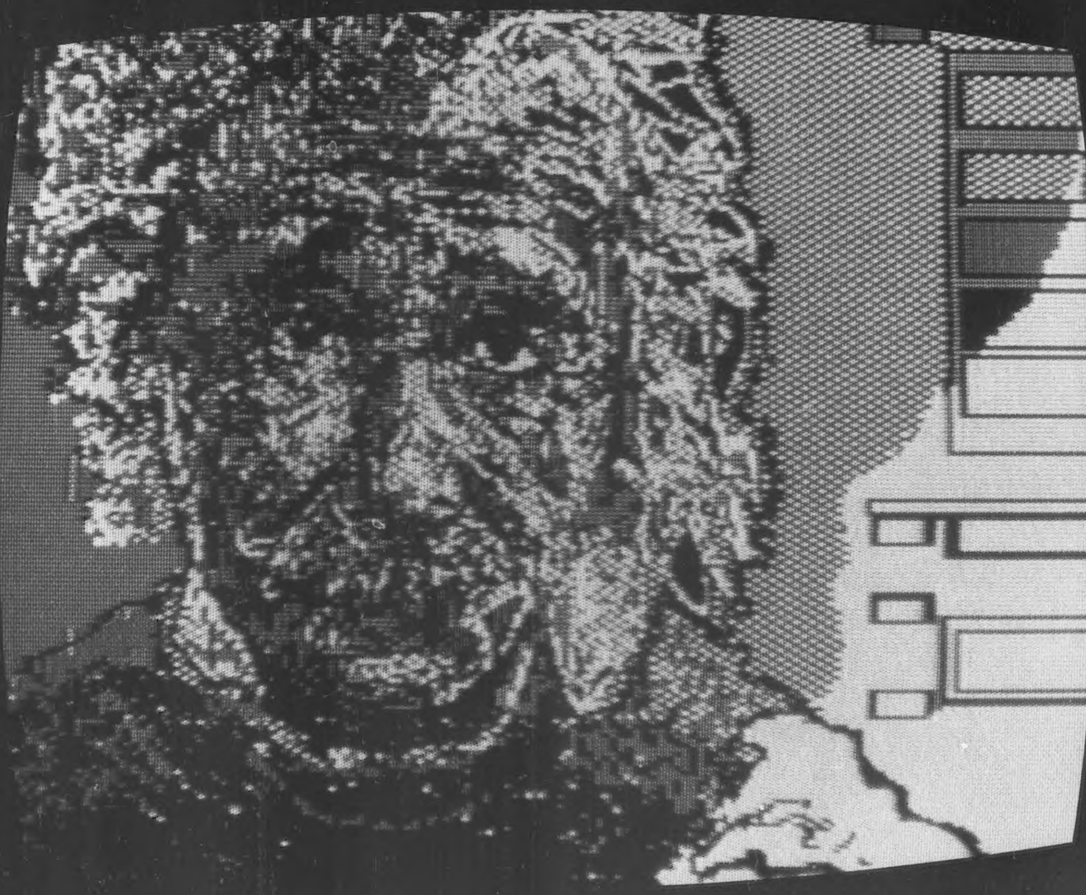
CIRCLE 249 ON READER SERVICE CARD



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CIRCLE 182 ON READER SERVICE CARD

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hooking up with ATARI

The Atari 830 Modem

George Blank

Using Atari's Telelink Cartridge to Access CompuServe

Joining a club? Learn the ropes beforehand and it goes a great deal smoother. If you visit someone who has a computer, play a few games under your friend's supervision, and learn such simple tricks as the location of the ON/OFF switch and the use of the RETURN key, you are far ahead of the person who wins a computer as a doorprize at a convention, then takes it home and tries to use it with only the manual as a guide.

For the personal computer owner who has never used a large computer or a terminal before, seeking to connect to a timesharing service may seem to be an overwhelming task. All of a sudden you have to cope with learning how to use a new program, an RS-232 interface, a modem, and a telephone in cooperation with your computer. It can be quite frustrating, for if you overlook one switch setting or miss plugging in a single cable, the system won't work, and you might not be able to tell whether you made a mistake or whether one of the pieces of equipment is defective.

Failure-prone equipment in this type of situation is a disaster. For example, the Radio Shack TRS-80 Model I RS-232 board is notoriously hard to use, primarily because Tandy used a cheap connector to attach it. Some owners actually disconnect the board, clean the contacts, and reinstall it every time they use it. A new user with a bad connection might become so frustrated as to give up all hope of timesharing.

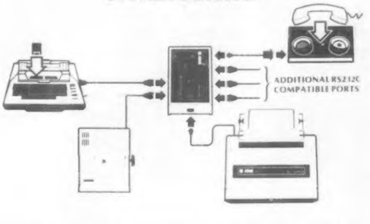
With the Atari Telelink cartridge, it took me several hours of work, accompanied by much frustration, to successfully hook up to CompuServe. I never did discover what I was doing wrong at first, but have come to the conclusion that the real problem was probably in our company telephone switchboard, not in the Atari equipment.

I hope that by a detailed sharing of the process that led to successful connection for me, I can make the same operation smoother for those of you who are considering timesharing.

Equipment Required

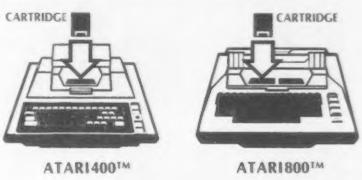
The equipment I used was an Atari 800 Computer (the Atari 400 should work just as well), the Atari 850 Interface Module, the Atari 830 Acoustic Modem, the Atari Telelink I program cartridge, a telephone, and a Texas Instruments 99/4 Color Monitor. The only difference in my unsuccessful attempts was that I used a Leedex Video 100 black and white monitor instead of the color monitor. The difference was significant, not for the color, but because the TI monitor has a speaker, and you need the speaker to hear whether the cartridge loads properly. An ordinary television set should work as well, but I do not recommend any monitor or TV set without a working speaker. I did not have a printer, but it would have helped significantly.

SYSTEM DIAGRAM



The Atari Telelink I (The I probably implies that a II is coming!) program cartridge is a typical Atari cartridge. You load it by simply plugging it into the slot on the computer, a task that my six-year old son has mastered with the Star Raiders and Basketball cartridges. The Telelink I cartridge comes with a six-page foldout instruction brochure, a registration card, an application for an account with CompuServe, an instruction card for hooking up to CompuServe Information Service, and a sealed envelope containing a CompuServe user identification number and a secret password allowing you one hour of free access to the network.

Inserting the TELELINK cartridge



The Atari 850 Interface includes a 102-page instruction manual that also covers the Atari 830 Modem. However, who is willing to read 102 pages of heavily technical material just to learn how to use an add on device on a computer system? Fortunately, you can use the manual strictly for reference, finding what you want in the table of contents.

Before you can use Telelink I to connect to CompuServe, you must have a local access telephone number. The card telling you how to access the timesharing service gives you Atari's toll free customer service number and tells you to call them for the access number closest to you. The customer service toll free number is very busy, and it took me about 20 calls over two days to get through. Once I did get connected, the representative gave me the names of cities in my area code with access numbers, and the telephone numbers.

Setting Up Your System

I will assume that you already know how to connect your Atari computer to a monitor or TV set, and only discuss the rest of the system. If you have a disk drive,

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2200 STEMMONS FRWY
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THURS-SUN
APRIL 9-12
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Atlanta Civic Center
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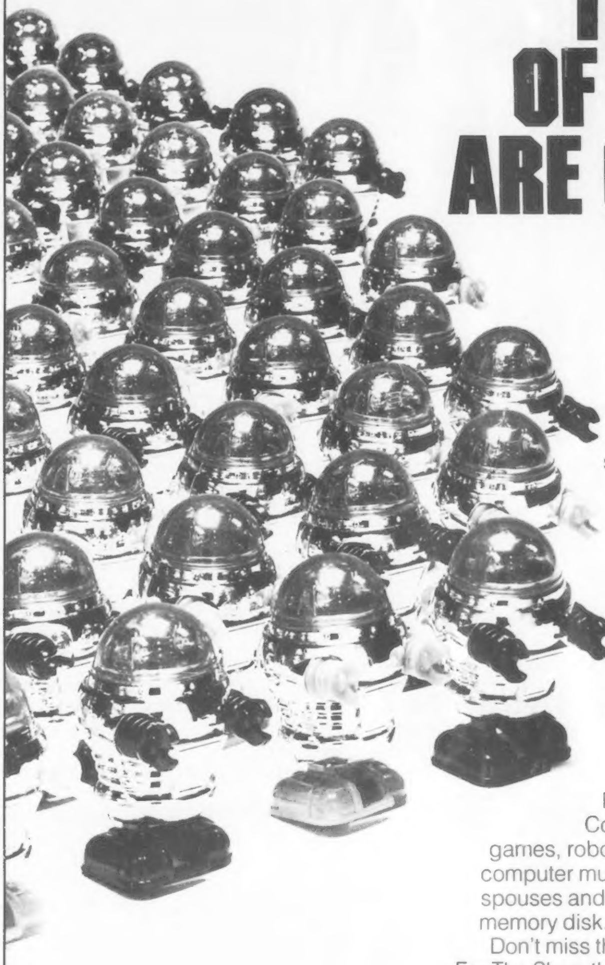
RALPH McGILL BLVD
THURS-SUN
OCTOBER 29-NOVEMBER 1
10 AM TO 7 PM



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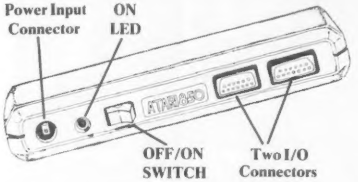
One of the five 1981 National Computer Shows produced by Northeast Expositions
824 Boylston Street, Chestnut Hill, Mass. 02167. Tel. 617 739-2000

Hooking Up, continued...

disconnect it, as the cartridge is not set up to work with the disk operating system, and the two conflict.

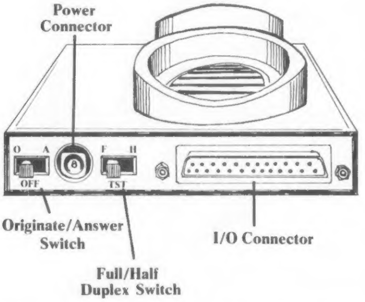
If you place the Atari 850 Interface on the table in front of you so that the label faces you, you will see the following:



Plug the power supply into the connector on the left and connect it to a wall outlet. Connect the I/O cable from the computer to the leftmost one of the two I/O connectors. If you have the printer that uses the I/O connectors, connect the printer to the right front connector. If you have the Atari 825 printer, there is a connector for this on the right end of the interface module.

On the back of the interface module are four identical serial connectors, labeled from one to four. Plug the small connector on the cable that comes with the Atari 830 modem into connector one on the interface, directly behind the power connector. Your interface is now connected.

The connectors and switches on the Atari 830 modem are all on the same end, as follows:



Connect the other end of the modem cable from the expansion interface to the large connector on the modem. Then plug the power supply for the modem into the connector on the modem and into a wall outlet. If the power LED in the center of the modem should come on, set the originate answer switch to OFF.

Bring your telephone over to the computer. Place the handset so that the cord hangs over the end of the modem that contains the connectors and switches. This is also plainly marked on the label in the top center of the modem. Your system is now connected and ready to go.

Making the Connection

Plug in your cartridge, and close the cartridge door. Turn on the television set or monitor. Then set the left switch on the modem to O (for originate) and the right switch to F (for full duplex). Both switches should be all the way to the left. The power LED on the modem should glow red. Next turn on the Atari 850 interface module using the switch on the front. The power LED next to this switch should come on.

After the rest of these connections are made, turn on the computer. If you turn on the computer before the interface, or have the disk drive connected, the program to operate the interface will not load properly. You should now hear a series of beeps from the television speaker to indicate that the program is loading. After the program has initialized, the words Telelink I will appear on the screen.

Now, dial the telephone access number for CompuServe that you obtained from Atari Customer Service. Unless the number is busy, it should ring a couple of times, then answer with a steady tone. When you get the tone, place the telephone handset in the cradle on top of the modem. Even before you finish placing the handset in the cradle, the two computers should recognize each other and the **READY** LED on the modem should come on.

Type **CONTROL C** on your keyboard. The TV screen should go blank, then CompuServe will print the message:

USER ID:

Respond by typing in the identification number in the envelope that came with your Telelink cartridge. Now CompuServe will print another prompt on your screen:

PASSWORD:

Type in your password, exactly as it is given in the envelope. The letters will not appear on the screen, so that you can keep your password secret if someone is watching. If you get it wrong, the computer will prompt you to try again.

CompuServe will now take a few seconds to log you in. It will recognize you as a new user and print a greeting message, plus give you instructions on using the system. It would be very helpful to have a printer turned on at this time to save the instructions for future reference. You will also be given an opportunity to open an account, either under Master Card or Visa or to be billed monthly, once your free hour is up.

Most of the time using the CompuServe network is as easy as reading the message on your screen, typing a number or a letter, and pressing **RETURN**. A few commands require you to type three or four letters, but these are explained.

My first time on the network, I read through the instructions for the various services, logged into the Atari Newsletter and sent a message to customer service, read several current stories from the New York Times, and looked through the other services. Then I typed EXIT and CompuServe logged me off the system and told me that I had been connected for 29 minutes.

There are literally hundreds of other computer services that you can connect to with Telelink or similar systems from other manufacturers. There are other timesharing services, including The Source and universities such as the Dartmouth

General Use		
CBBS	Pasadena CA	(213) 795-3788
(Community Bulletin	Akron OH	(216) 745-7855
Board Service)*	Cambridge MA	(617) 864-3819
User Groups		
Forum 80 (TRS-80)	Chicago	(312) 269-8083
	Ft. Worth	(817) 923-0009
COMM 80 (OCTUG – TRS 80)	CA	(714) 526-3687
ABBS (Apple)	Seattle	(206) 244-5438
	New York	(212) 448-6576
PET BBS	Ypsilanti MI	(313) 484-0732
NORTHSTAR	Atlanta	(404) 939-1520
Interest Groups		
Genealogy	Fairfax VA	(703) 978-7561
Amateur Radio	Washington DC	(703) 281-2125
Commodities	Kansas City	(816) 931-3135
Avionics	Olathe KS	(913) 782-5115
Computer Stores		
Program Store	Washington DC	(202) 337-4694
Peripheral People	Seattle WA	(206) 723-DATA

For more information about the two most popular commercial timesharing networks. use these numbers. They are not numbers for computer access.

CompuServe	Columbus OH	(614) 457-8600
The Source	McLean VA	(703) 821-6660

Time Sharing Service. There are many free message services all over the country. While some of them emphasize a particular computer system, most welcome all comers. You may want to try some of the services listed in the table. After you dial the number and get the tone, place your handset in the cradle and press **RETURN** a couple of times. The various systems should take you from that point. Please note that some of these numbers may be out of date when this article appears. Once you log onto several of them, you can usually find out about many more. Some of these numbers are only in operation after normal business hours for timesharing, as they are owned by businesses that use the lines during the day.

The Telelink Program

As timesharing programs go, Telelink I is very limited, but it is also one of the easiest such programs to use. It is permanently set up for 300 baud (a rather slow rate of communication, especially when you are paying the phone bill), transmits even parity with one stop bit while receiving even parity or no parity, does not allow you to write files to disk, and has a fixed character set. If you try to access a computer system that does not accept any of these limitations, you will not be able to communicate. Actually, most timesharing systems are either set up this way or allow the user to specify his own configuration.

Telelink stores print characters in a buffer, so that you do not always have to wait for the printer to read the screen. You can turn the printer on and off from the program. It can communicate either Full Duplex (both computers sending messages at the same time) or Half Duplex (the two computers must take turns.)

Control characters that can be sent by Telelink I include TAB, ESCAPE, CONTROL A through CONTROL Z (including Linefeed, Bell, XON, and XOFF), RETURN, BACKSPACE, and RUB OUT.

The Atari 850 Interface

The 850 Interface module allows you to add four RS-232 serial ports and a parallel printer port to your Atari 800 or 400 computer. This allows you to connect printers, modems, and other standard peripherals to your computer. Although you would probably have to write the software yourself, you should be able to use it to connect lab equipment, a graphics tablet, a plotter, or other special purpose devices.

Atari does not currently offer any printer cables for use with the 850 Modem, except the one that comes with the 825 Printer. If you do not want to buy a $995 printer to get a $30 cable, you may be forced to create your own. To do that, you will need the part numbers and manufacturers of the appropriate connectors. The 25-pin parallel port uses an AMP connector, part number AMP 205-208-1. The 15-pin parallel ports use either AMP or Cannon connectors, part number AMP 205-206-1 or Cannon DB-15-P. The RS-232 serial ports use either the AMP 17-20096-1 or the Cannon DB 9-P connectors.

The Atari 830 Modem

This modem is a standard acoustic modem, very similar to the Novation CAT. By buying it from Atari, you get the Atari name on the label, and a cable that you know will connect to your interface, and Atari service. ☐

Prices

Telelink I	$24.95
Atari 850 Interface	$219.95
Atari 830 Modem	$199.95

Atari, Inc.
Consumer Division
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24 PIN	.26	.24
28 PIN	.30	.28
40 PIN	.40	.38

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RS-232 CONNECTORS

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DB25S	3.80	3.70	3.60
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A Guide to Data Banks

The growing trend in data banks is for the industry to divide into producers (assemblers) and distributors (vendors). The producers are usually small companies that don't have the capacity to sell and service their products; they make agreements with distributors, who are better equipped to handle the marketing and installation of the equipment.

The following chart lists alphabetically major distributors of data banks with a wide selection of subject matter. Pricing information is not included because it depends on variables that are too numerous to place in a chart. For example, the Value Line data bank, containing stock-market and related financial data on more than 1,500 companies, is available from producer Arnold Bernhard and Co. for a $5,000 annual subscription fee. Value Line is also available from seven different distributors; these distributors charge the $5,000 fee plus their own fees for frequency of use and length of time used. Some distributors charge by the minute, others by 15-minute slots; and still others have minimum-time requirements. Sometimes more than one data bank is offered for the price of one subscription fee. To illustrate, the distributor Rapidata offers both the Flow of Funds data bank (on the money flow through various sectors of the United States economy) and the RAPIDQUOTE data bank (of price and volume data on 14,000 securities) to subscribers of its other data banks at no extra charge.

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ADP Network Services, Inc. P.O. Box 2190 175 Jackson Plaza Ann Arbor, MI 48106 (313) 369-6800	A large distributor offering computational data banks in: Agriculture, Autos, Commodities, Demographics, Economics, Finance, Insurance, and International Business. Its main suppliers are Chase Econometric Associates and Standard & Poor's.
Bibliographic Retrieval Services, Inc. Corporation Park Building 702 Scotia, NY 12303 (518) 374-5011	A large distributor offering bibliographic data banks in: Agriculture, Business, Education, Environment, General News Publications, Science, and Social Science. Its suppliers are various trade associations and governmental groups.
CompuServe Network 5000 Arlington Centre Blvd. Columbus, OH 43220 (614) 457-8600	A distributor offering statistical data banks in: Demographics, Economics, and Finance. Its suppliers include Citibank, Value Line (Arnold Bernhard and Co.), and Standard & Poor's.
The Computer Co. 1905 Westmoreland St. Richmond, VA 23230 (804) 358-2171	A statistical data-bank vendor specializing in the Airline Industry. Its main supplier is the Civil Aeronautics Board.
Data Resources, Inc. 29 Hartwell Ave. Lexington, MA 02173 (617) 861-0165	A large vendor offering data banks in: Agriculture, Banking, Commodities, Construction, Economics, Energy, Finance, Insurance, International Business, Securities, and the Steel and Transportation Industries. In addition, detailed U.S. regional, national, and international economic, demographic, and financial indicators are tracked. Compustat, Value Line, and Standard & Poor's are sources.
Dow Jones News/Retrieval Service 22 Cortlandt St. New York, NY 10007 (212) 285-5000	A bibliographic data bank compiling *The Wall Street Journal*, *Barron's*, and the Dow Jones News Service. Dow Jones compiles its own data bank, which is updated immediately after appearing on the ticker and then maintained for ninety days.
General Electric Information Services Co. 401 N. Washington St. Rockville, MD 20850 (301) 340-4000	A computational data-bank vendor covering: Economics, Energy, Finance, and International Business. Its suppliers include the University of California and Value Line.

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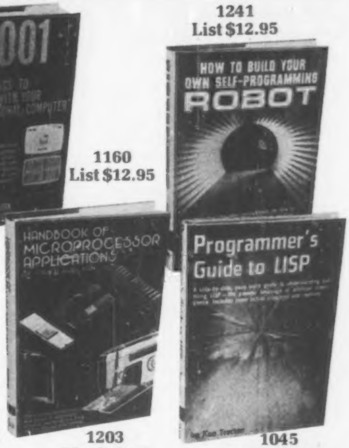
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Time Sharing Resources, Inc. 777 Northern Blvd. Great Neck, NY 11022 (516) 487-0101	A statistical data-bank vendor covering: Commodities, Economics, and Finance. Its suppliers include the U.S. Department of Labor, Citibank, and the Federal Reserve Board.
Uni-Coll Corp. 3401 Science Center Philadelphia, PA 19104 (215) 387-3890	A computational data-bank vendor covering: Agriculture, Commodities, Economics, and Finance. The Wharton Economic Forecast supplies most of its data banks.
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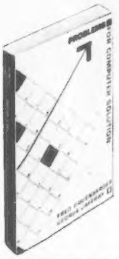

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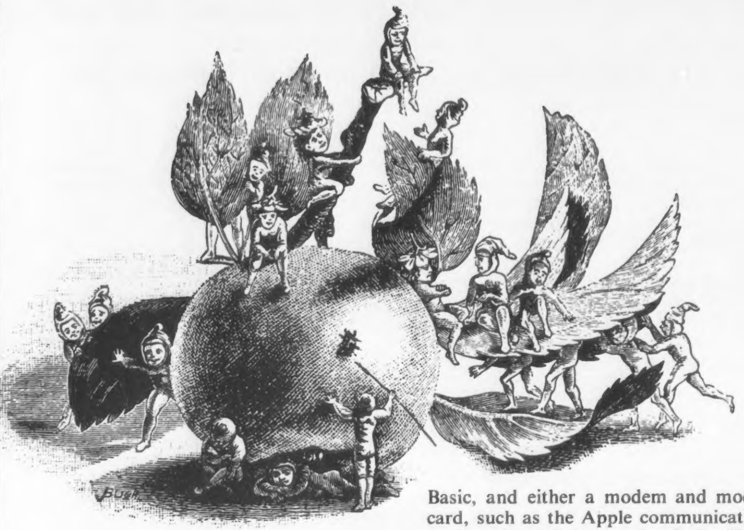
Apple as Time-Sharing User

James Parr



This is a mite specialized, but for our many Apple readers, it's a helping hand into the world of time-sharing. — Ed.

Introduction

A properly equipped personal computer (such as the Apple II) can not only do computations of its own; it can be used as a terminal to a time-sharing system, and can communicate with the time-sharing system even when not acting as a terminal. This allows such applications as: transmitting your data or programs to the time-sharing system; transferring time-sharing files to your disk or tape, where they can be used by your computer as programs or data, or just saved as an archive to be restored to the time-sharing system later; having programs in your computer reference data from the time-sharing system or use time-sharing programs as subroutines. In short, almost all of the facilities of the time-sharing system are made available to the personal computer, and vice-versa.

This article presents some examples of techniques and programs for communication between an Apple II microcomputer and the Educational Computing Network (ECN), a CDC-based time-sharing network for some state universities in Illinois. With small modifications, these techniques should work on other time-sharing systems. Adaptation to other personal computers is more difficult, since the Apple programs are tailored to the peculiarities of Applesoft Basic and the Apple operating system.

To make use of these techniques, you need an Apple II computer with Applesoft Basic, and either a modem and modem card, such as the Apple communications card and modem, or the D.C. Hayes Micromodem II (total retail about $1600, if you already have a TV or monitor). The last program uses a disk drive, but it could be adapted for cassette storage, or to use data directly instead of storing it on a file.

Making Contact: Apple As Terminal

Terminals and time-sharing systems operate in either full duplex or half duplex mode. A time-sharing system operating full duplex sends back ("echoes") to the terminal for every character it receives; the terminal in full duplex mode doesn't print the character when it is typed at the keyboard, but only when it is sent back by the system. In half duplex mode, the terminal prints each character, and the system does not echo it back. If the duplex modes of the terminal and the system do not match, each letter typed will be printed twice, or not at all. On ECN, the command FULL or HALF can be entered to change the system from one duplex mode to the other. The extra input to the Apple from the echoing makes it a little more difficult to write programs to communicate with a full duplex system, so we shall want the system in half duplex mode for all of this work.

Almost all of the facilities of the time-sharing system are available to the personal computer.

The following series of commands turns your Apple into a half-duplex terminal, ready to dial up a time-sharing system. Replace MSLOT with the number of the Apple slot your modem card is in. This procedure is for the Apple communications card and modem. (For more detail or a different modem, consult your modem manual.)

```
]PR# MSLOT

]PRINT

]PR# 0

]POKE 2040 + MSLOT, 9

]IN# MSLOT

]ctrl-A ctrl-H
```

The switches on the CAT modem should be set to O and F. The POKE sets the data format; different systems use different formats, so consult your manuals.

The Apple has a few peculiarities as a terminal: Its screen is only forty characters wide. The keyboard has no underscore, left bracket, or backslash, although these characters will be printed on the screen if sent by the system, and can be transmitted by an Apple program using the CHR$ function. Sending the break character is done by pressing ctrl-A ctrl-S, and cancelled by pressing any key.

Once in half-duplex terminal mode, the Apple responds to a keypress only by printing it on the screen and sending it out through the modem, with two exceptions: RESET and control sequences starting with ctrl-A. Pressing ctrl-A ctrl-X takes the Apple out of terminal mode and back to normal functioning ("local mode" or "local control"). So does RESET, but sometimes with undesirable side effects. If this is done without logging off from ECN, ECN will wait on the line up to its usual time limit while you use the Apple to run Applesoft, save or load programs, etc. Then you can reenter terminal mode with the sequence

```
]POKE 2040 + MSLOT, 9

]IN# MSLOT

]ctrl-A ctrl-H
```

and resume working with the Apple as a terminal; ECN will still be on the line. If the system has sent anything while the Apple was in local mode, some characters or blank lines may appear on the screen as soon as you enter IN# MSLOT. Sometimes the IN command undoes the POKE.

J. T. Parr, Mathematics Department, Illinois State University, Normal, IL 61761.

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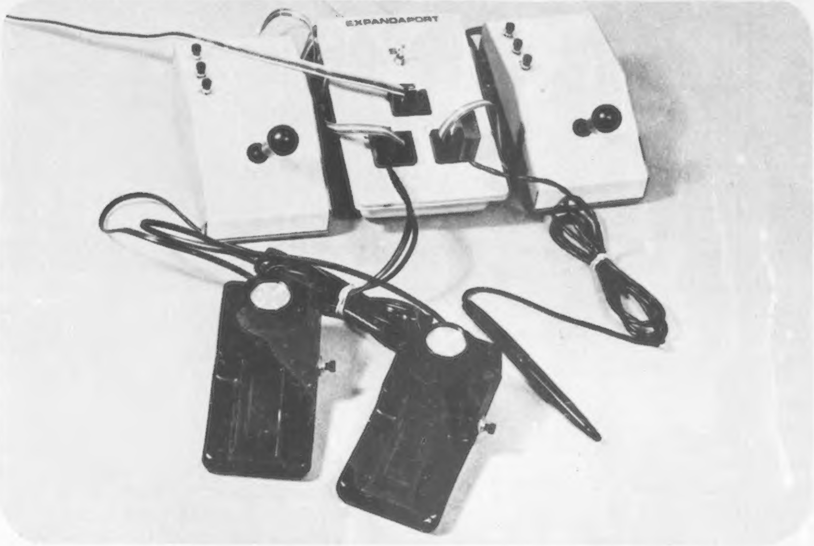

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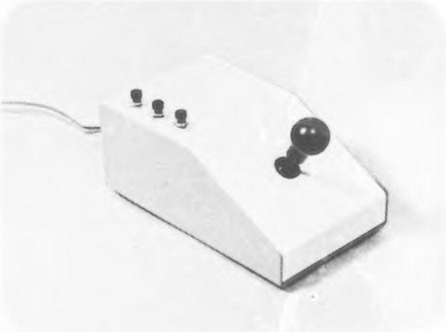

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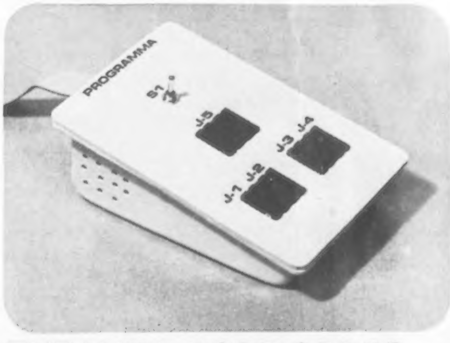

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CIRCLE 231 ON READER SERVICE CARD

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Time Sharing, continued...

If you can't get any response from the system but ILLEGAL COMMAND, go back to local mode and repeat the sequence starting with the POKE.

While the Apple is in local mode, a PR# MSLOT command causes all subsequent output to be sent through the modem as well as to the screen, until a PR# O or RESET cancels it. An IN# MSLOT causes the Apple to ignore keyboard input except for RESET and ctrl-A sequences, and listen only to the modem until the next IN# O or RESET. These commands can be used directly or in programs to communicate with ECN while the Apple remains under local control, running Applesoft programs or responding to direct commands from the keyboard.

If you use the IN and PR commands in a program running under DOS, they can disconnect the disk I/O. This can be corrected by following each PR# O with POKE 54, 189: POKE 55, 158, and each IN# O with POKE 56, 129; POKE 57, 158. The DOS manual recommends putting the PR and IN commands in PRINT statements. Then the POKEs aren't necessary, but the program will work only under DOS, and you must be sure NOMON C is in effect before each PR# MSLOT, or you may send those commands as output through the modem. There is no difficulty with IN# and PR# as direct commands, since direct commands are all handled through DOS anyway.

Sending Program Output

Here is a program which sends its output to the time-sharing system:

```
100  REM   TIME-SHARING
102  REM   GRADEBOOK
104  REM ---------------
110  LET MSLOT = 2
120  POKE 2040 + MSLOT, 9
130  PR# MSLOT
140  PRINT "   NAME";
150  PRINT  TAB( 20);"SCORES";
160  PRINT  TAB( 30);"AVERAGE"
170  FOR T = 1 TO 100:NEXT
180  PRINT
190  PR# 0
200  REM -----------------
210  FOR N = 1 TO 200
220 : INPUT "NAME, SCORES?
    ";N$,S1,S2
225 : IF N$ = "" THEN 290
230 : LET AV = .5 * (S1 + S2)
235 : PR# MSLOT
240 : PRINT N; TAB( 4);N$;
245 : PRINT  TAB( 20);S1;
    TAB( 25);S2;
250 : PRINT  TAB( 30);AV
255 : PR# 0
260 : NEXT N
290  REM
300  END
```

```
list

 80/03/24. 15.48.22.
PROGRAM   ASEND

1000  REM **********************
1001  REM   ASEND               *
1002  REM COPIES ANY TEXT FILE *
1003  REM TO AN ECN TEXT FILE. *
1004  REM ECN MUST BE IN TEXT  *
1005  REM MODE TO USE IT.      *
1006  REM                      *
1007  REM  J. T. PARR          *
1008  REM  MATHEMATICS DEPT    *
1009  REM  ILL. ST. UNIV.      *
1010  REM  VERSION 3/13/80     *
1011  REM **********************
1080 :
1110  LET MSLOT = 2
1120  LET DFMT = 9
1130  LET D$ =  CHR$ (4)
1140  LET CA$ =  CHR$ (1) +  CHR$ (1)
1150  INPUT "FILE TO BE COPIED? ";F$
1190 :
1200  REM -- D O S  COMMANDS
1210  PRINT
1220  PRINT D$;"NOMON C,I,O"
1230  PRINT D$;"OPEN ";F$
1240  PRINT D$;"READ ";F$
1250  SPEED= 255
1260  ONERR  GOTO 1400
1290 :
1300  REM -- C O P Y
1310  FOR C = 1 TO 1E30
1320 : GET C$
1330 : PRINT CA$;
1340 : POKE 2040 + MSLOT,DFMT
1350 : PR# MSLOT
1360 : PRINT C$;
1370 : PR# O
1375 : POKE 54,189: POKE 55,158
1380 : IF  ASC (C$) = 13 THEN  FOR
     T = 1 TO 500: NEXT
1390 : NEXT C
1395 :
1400  REM -- C L O S E   U P
1410  PR# MSLOT
1420  POKE 2040 + MSLOT,DFMT
1430  PRINT  CHR$ (3);
1440  PR# O
1445  POKE 54,189: POKE 55,158
1450  PRINT
1460  PRINT D$;"CLOSE ";F$
1470  PRINT "EXITED TEXT MODE."
1480  PRINT "DON'T FORGET TO PACK."
9999  END
READY.
```

Listing 1

When this program is run with the Apple in half duplex mode, everything that appears on the screen while PR# MSLOT is in effect will also be sent through the modem to the time-sharing system. Commas in PRINT statements do not provide automatic tabbing as they do on the screen, but semicolons, TAB and SPC give their usual results. Notice that the INPUT statement is not within the scope of a PR# MSLOT; if it were, its prompt and the user's response would also be sent through the modem. ECN requires a pause after a carriage return (a PRINT that does not end in a comma or semicolon) before it is ready to receive more output from the Apple; for FOR-loop in line 170 provides the necessary delay before the following PRINT statement, and the INPUT command inside the loop assures a pause before the next PRINT.

To prepare ECN to receive the output, we use ECN's TEXT mode, which causes it to put all characters it receives into the primary file. While addressing ECN as a half-duplex terminal, enter

```
NEW,name of file to receive output

TEXT

ctrl-A ctrl-X

]RUN
```

Since the Apple has been left in half duplex mode, the program output will now be seen on the screen, along with the INPUT prompts and responses, while the output without the prompts and responses is also being sent into the ECN file. When you get the Applesoft prompt again, enter

```
]POKE 2040 + MSLOT, 9

]IN# MSLOT

]ctrl-A ctrl-H

ctrl-C
```

The ctrl-C takes ECN out of TEXT mode, and gets you the message EXIT TEXT MODE. In TEXT mode several invisible "end-of-record marks" will have been inserted in the file. They are removed by entering the PACK command. Enter NOSORT and LNH to see the results. You can then SAVE or XEDIT the file.

Listing A Program To ECN

Suppose you have a program in Apple memory which you would like to send to an ECN file, and that it has no line numbers less than 10. Then add these lines to the program. Replace MSLOT with your modem slot number.

```
1 SPEED = 80: POKE 33,33
2 POKE 2040 + MSLOT, 9
3 PR# MSLOT
4 LIST 10,
5 FOR T = 1 TO 100 : NEXT
6 PRINT CHR$(3)
7 PR# 0
8 SPEED = 255: POKE 33,40
9 END             (or, DEL 1,9)
```

Now get in contact with ECN as a half-duplex terminal, and enter

```
NEW,name of file to receive listing

TEXT

ctrl-A ctrl-X

]RUN
```

This runs lines 1-9. When line 4 lists your program, PR# MSLOT is in effect, so the listing goes out through the modem to ECN. The POKE 33,33 sets the Apple screen width to 33, which keeps the listing routine from inserting extra carriage returns into the listing. (They can also be avoided by using ctrl-A ctrl-F to put the Apple, but not ECN, into full duplex mode; but then the listing will not show oin the Apple screen.) SPEED = 80 is to help keep ECN from dropping a character after each carriage return. The listing will take quite a while: two and half minutes for a program of eighty-five short lines. Eventually, you will get the Applesoft prompt back. Line 6 sent a ctrl-C to ECN, so it will be out of TEXT mode already. Enter

```
]POKE 2040 + MSLOT, 9

]IN# MSLOT

]ctrl-A ctrl-H

PACK
```

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CIRCLE 230 ON READER SERVICE CARD

Listing 2

```
 80/03/24. 15.50.04.
PROGRAM   RECEIVE

100  REM --------------------
110  REM  RECEIVES TEXT FILE
120  REM  FROM CDC BASIC PGM
130  REM  BSEND.
140  REM
150  REM  J T PARR
160  REM  MATHEMATICS DEPT
170  REM  ILLINOIS STATE UNIV.
180  REM  VERSION 3/14/80
199  REM --------------------
200  REM  C O N S T A N T S
205  REM --------------------
210  LET DUMMY$ = "*"
220  LET D$ =  CHR$ (4)
230  PRINT "NAME OF FILE TO COPY TO";
240  INPUT F$
250  LET MSLOT = 2
260  LET DFMT = 9
290  REM --------------------
300  REM  D O S   C O M D S
310  REM --------------------
320  PRINT D$;"MON C,I,O"
330  PRINT D$;"OPEN ";F$
340  PRINT D$;"DELETE ";F$
350  PRINT D$;"OPEN ";F$
390  REM --------------------
400  REM  I N P U T   L O O P
410  REM --------------------
420  ONERR  GOTO 900
430  FOR L = 1 TO 1E20
440 : LET L$ = ""
445  REM -- GIVE GOAHEAD
450 : PR# MSLOT
460 : POKE 2040 + MSLOT,DFMT
470 : PRINT 1
480 : PR# 0
490 : POKE 54,189: POKE 55,158
500  REM --------------------
501  REM  L O A D   L$
502  REM --------------------
505 : IN# MSLOT
510 : FOR C = 1 TO 1E20
520 :: GET C$
530 :: IF  ASC (C$) = 13 THEN 560
540 :: LET L$ = L$ + C$
550 :: NEXT C
560 : REM    G E T   P R O M P T
565 : GET P$: IF P$ = "" THEN 565
570 : PRINT
580 : IN# 0
590 :
600  REM --------------------
601  REM  P R I N T   L$
602  REM --------------------
640 : PRINT D$;"WRITE ";F$
650 : PRINT L$
660 : PRINT D$
675 : IF P$ = DUMMY$ THEN L = 1E30
680 : NEXT L
690 :
700  REM --------------------
710  REM  C L O S E   U P
720  REM --------------------
725  POKE 216,0
730  IN# 0
740  PR# 0
750  POKE 54,189: POKE 55,158
755  PRINT
770  PRINT D$;"CLOSE"
780  END
799  REM --------------------
900  REM   E R R O R
909  REM --------------------
910  PRINT
920  PRINT "ERROR # "; PEEK (222)
930  PRINT "(FOR TABLES OF
     ERROR NUMBERS"
935  PRINT "SEE APPLESOFT
     & DOS MANUALS)"
940  POKE 216,0
950  PR# MSLOT
960  PRINT "STOP"
990  GOTO 700
995 :
READY.
```

There will be a blank line at the top of the listing, and if ECN was not able to keep up after the carriage returns, first digits of some line numbers will be missing. These problems can be corrected with the editing package, giving a good copy of the program on an ECN file to save, print, edit, etc. Lines of more than 150 characters are not accepted by ECN.

If you put lines 1-9 above on a disk text file, you can EXEC the file. If you have included the line numbers on the file, those lines will be appended to the beginning of your program. If you left the line numbers off the file, the commands will be executed directly; in that case, some of them may be printed on the file along with the program listing.

There is a more roundabout way which you might prefer if you have a disk. List your program to a disk file, making sure that POKE 33,33 or NOMON O is in effect to avoid those extra carriage returns. This listing won't take so long, at SPEED = 255. Then use the Apple ASEND program to send the text file with the listing on it to ECN. With the Apple in half duplex mode, the listing will be displayed on the screen as it is being sent. The ASEND program uses a delay loop after each carriage return, so it can send each line at SPEED = 255 without ECN missing any characters, and without taking so long to send the listing.

If the duplex modes of the terminal and the system do not match, each letter typed will be printed twice, or not at all.

Copying Disk Text Files To ECN

The Applesoft program ASEND (Listing 1) can be used to transfer any Apple disk text file to an ECN file. The following steps will accomplish the move. Get DOS operating and connect with ECN as a half-duplex terminal.

```
NEW,name of file to write to

TEXT

ctrl-A ctrl-X

Insert disk with ASEND.

]LOAD ASEND

Insert disk with text file.

]RUN

Enter name of file to be copied.

]IN# MSLOT

]ctrl-A ctrl-H

ctrl-C

PACK

SAVE
```

```
100 REM**************************
110 REM BSEND: CDC BASIC PGM    *
120 REM  SEND TEXT FILE TO      *
130 REM  APPLE II MICROCPTR     *
140 REM  FROM ECN.              *
150 REM                         *
181 REM   J T PARR              *
182 REM   MATHEMATICS           *
183 REM   ILLINOIS STATE UNIV.  *
184 REM VERSION 6/11/80         *
190 REM**************************
200 REM   S E T   U P
210    FILE #1 = "TEXT"
220    DELIMIT #1, (CR)
230    RESTORE #1
240    MARGIN 0
300 REM   T R A N S M I T
310    FOR L=1 TO 1E30
315      IF END #1 THEN 400
320      INPUT G
330      INPUT #1, L$
340      PRINT L$
350      NEXT L
400 REM  S I G N   O F F
410    PRINT "*"
999    END
READY.
```

Listing 3

Copying Files To Apple Disk

Since the Apple lacks the equivalent of the ECN TEXT mode, we use an Apple program RECEIVE (Listing 2) to receive text being sent by ECN and write it onto a disk file. If you don't have a disk, a program including some of the techniques of RECEIVE could receive the data and use it directly or STORE it on a cassette. The sending is done by a CDC Basic program BSEND (Listing 3), which sends a line of the file each time RECEIVE signals that it is ready. BSEND is very simple and straightforward, while the idiosyncracies of Apple DOS and the communications card make the RECEIVE program more complicated.

The following sequence shows how to use the BSEND and RECEIVE programs. We assume that DOS is in effect and that the Apple is connected to ECN as a half-duplex terminal.

```
OLD,BSEND

GET,TEXT=name of file to be copied

RNH

Wait for ? prompt, then press
ctrl-A ctrl-X

Insert the disk containing RECEIVE.

]LOAD RECEIVE

Insert the disk you want the file
copied to.

]RUN
```

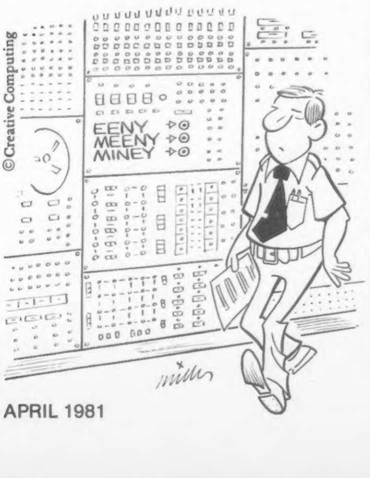
Answer the prompt with the name you wish the disk copy of the file to have. When you get the Applesoft prompt again, the copy is complete. You may then return to terminal mode and log off. Most errors that occur will be intercepted by an error-handling routine in RECEIVE, but if somehow the Apple should "hang" so that it is necessary to RESET, be sure to enter a CLOSE command to safeguard the file and your disk.

If the file you have copied contains a Basic program and you want to use it as such instead of as data, the command EXEC filename will enter it into the Apple memory as a program, where you can edit it, run it, and save it.

Notes On The Program

In order to be able to deal with all characters, including commas and quote marks, the Apple programs ASEND and RECEIVE use the GET command instead of INPUT. The GET command causes the next PRINT command to lose characters; hence the extra PRINT statements following each series of GET commands. Not only may some output be lost, but if it happens to be the CHR$(4) preceding a DOS command, then DOS will not receive the command. The manual recommends printing an extra CHR$(1) character as the one to be lost, but in some cases that seems not to be sufficient, so ASEND uses two before each PRINT to the modem, and a carriage return before the CLOSE command. You can use INPUT instead of GET, if your application is compatible with INPUT's treatment of blanks, commas, and quotes.

In BSEND, the DELIMIT statement cancels commas and quote marks as delimiters, allowing the INPUT statement to read into L$ the entire next line of the file, no matter what it contains. MARGIN O allows BSEND to transmit lines of arbitrary length without inserting carriage returns. The sequence of events in the loop in BSEND is critical for correct synchronization with RECEIVE. RECEIVE has to intercept the BSEND prompt right after it has received a line. If it were to do so later, the prompt might already have been sent by the time the GET is executed, and it would wait indefinitely for a prompt. If ECN is responding quickly, getting P$ could be skipped, and the prompt would just be lost while the Apple writes L$ to the file; but a delay on the part of ECN could then cause the ? to be got as part of the next L$. The loop for getting the prompt flushes out null characters sent by ECN after each carriage return. ☐



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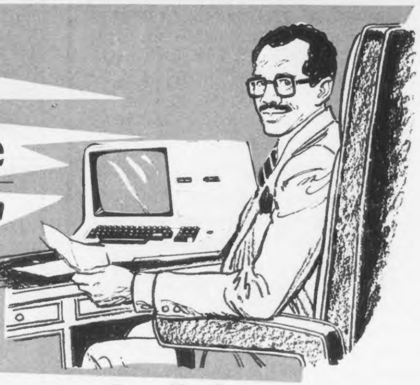
CIRCLE 208 ON READER SERVICE CARD

A Manager and His Machine

Robert Heltman



The heartwarming story of a small computer that finds a home in big business.

Reflections after eight months: a report from a middle manager in a large corporation, who has recently incorporated an Apple into his office work life both to improve productivity and continue his education. Did it work? Let's see . . . .

This article fulfills an unwritten promise to myself and the colleagues who blessed my purchase of a portable computer at company expense. I hope it will help other executives to decide if they should take such a step and, if they do, how such a computer might be used to their advantage.

These days most executives in large organizations have access to large computers for business reports. Our paychecks arrive with the unmistakable imprint of computer preparation. More and more tasks in all areas of business are being tackled and improved by the computer.

In our Human Resources Department at General Electric in Erie, PA, we have large-scale computer systems for general employee information, equal employment opportunity tracking, payroll and exempt annual manpower review data. Many standard and special reports can be obtained periodically or overnight. The manpower data is also on-line searchable and is used to generate candidate slates and to perform various analyses.

But in my role in human resource management—and, I believe, in many other areas—there has been a sort of no man's land where certain needs and ideas just don't quite get the attention or budget priority that does, and should, go to larger projects tackled by larger computers.

In addition, on some approved computer projects, there seem to be difficulties involved in translating the general concepts of what is needed into fully usable output. Have you ever noticed that when you meet with your systems analyst or programmer, the conversation goes something like this:
Analyst/programmer: "What do you want to be able to do?"
You, after some general statements: "What *can* be done?

While users need to do a better job of defining what they need it is also true that the programmer should be expected to "bring something to the party." This is most often possible when he has worked on similar applications before. However, if you are in a unique field or are developing a new application, you are often on your own.

> ***I'm not an electronics expert, nor am I a computer "nut" or hobbyist. I'm a businessman pursuing productivity and better ways of doing things.***

As a new computer project gets underway, you may find that when the first output is delivered you get new ideas about what you'd *really* like to have? This goes through several cycles, while time goes by, costs rise and your programmer sincerely wishes he'd undertaken a different career—maybe milking goats in a monastery?

What these situations boil down to is this: it seems that defining and developing a new application has an interactive quality. That is, you outline what you think you want, then see the output results, which in turn triggers thoughts on what else you'd like to have. This cycles several times until you either get what you want or reach an acceptable compromise.

Last November this situation was bothering me more than usual, but so was something else. That was the growing realization that we live in the age of the "microprocessor"—that tiny computer on a thin quarter-inch-square chip that is putting "brains" into games our children get at Christmas, and products like microwave-ovens, as well as into the manufacturing processess and machines that make those products. Business magazines, as well as enlishtened managers everywhere, talk about America—*our* country!—being far behind in productivity, while Japan and other nations are far ahead in robots and computers.

In the middle of all this I said to myself, "What am I doing about my own education in this new microprocessor revolution?" The answer then was, "Not enough!"

These two factors—productivity and my educational gap—concerned me so much that during last Thanksgiving vacation I dropped into my nearest computer stores, talked to the managers, and bought three books on digital electronics and small portable computers. While a lot of it was over my head, I began to get a feel for microelectronics and what could be done. For an economics/business administration major, it was at least a start.

As you can tell, I'm not an electronics expert, nor am I a computer "nut" or hobbyist. I'm a businessman pursuing productivity and better ways of doing things.

Robert F. Heltman, Manager-Organization and Manpower Transportation Systems Business Division, General Electric Co., Erie, PA 16531.

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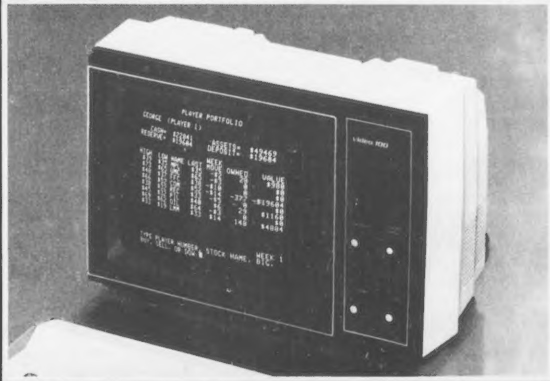

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4 ALL NEW GUIDES

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The Apple II User's Guide by Lon Poole, Martin McNiff, and Steven Cook #46-2, $15. ☐

This Guide is the key to unlocking the full power of your Apple II or Apple II plus computer. The Apple II User's Guide brings together in one place a wealth of information for Apple computer users. It will tell you more about your Apple than any other single source. This book will save you both time and effort. No longer will you have to search endlessly for useful information. It's all here, in the Apple II User's Guide, thoughtfully organized and easy to use. Topics include:

*Applesoft and Integer BASIC programming - especially how to make the best use of Apple's sound, color and graphics capabilities. The book presents a thorough description of every BASIC statement, command and function.

*Advanced programming - special sections describe High Resolution graphics techniques and other advanced applications.

*Hardware features - the disk drive and printer are covered in separate chapters.

*Machine level programming - although not a machine language programming guide, this book covers the Machine Language Monitor in detail.

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PET/CBM Personal Computer Guide *Second Edition* by Adam Osborne and Carroll Donahue #55-1, $15. ☐

The *PET/CBM Personal Computer Guide* is a step-by-step guide that assumes no prior knowledge of computers. If you can read English, you can use this book. This revised second edition provides even more useful material than the popular first edition. It covers the most recent CBM products: the CBM 8000 and 4000 series computers, the 2040 and 8050 disk drives, and programmable printers. Adam Osborne co-authored this new edition. He has re-written it to be a step-by-step BASIC tutorial. So if you don't know BASIC, don't worry. This book will teach you both BASIC and CBM BASIC. If you're thinking about buying any personal computer, this book will show you what the PET can do for you. If you've just bought a PET or CBM, this is the book you must have to really understand your computer. By using the examples found in this book you'll quickly get your PET/CBM up and running. These examples are thoroughly documented so you can learn how and why the programs work. It's the "how" and "why" that are important in learning to make the PET work efficiently for you. The PET Personal Computer Guide covers everything you'll need to be master of your PET.

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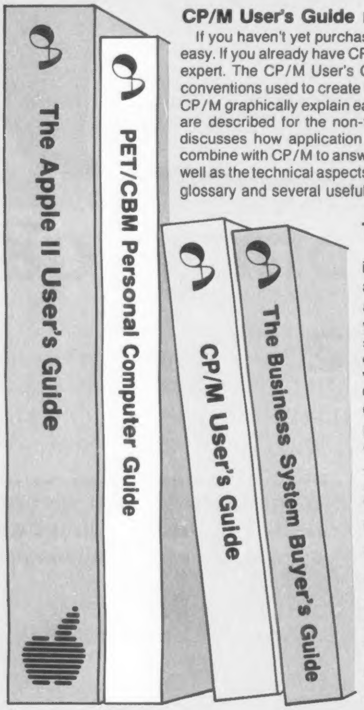
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CP/M User's Guide by Thom Hogan #44-6 $12.99 ☐

If you haven't yet purchased CP/M for your system, the CP/M User's Guide will make your first use of CP/M easy. If you already have CP/M, this book will help you modify your system and let you "jockey your disks" like an expert. The CP/M User's Guide describes types of CP/M and their compatibility. It includes a discussion of conventions used to create file names and command lines. Numerous sample screen displays for each version of CP/M graphically explain each operator command and computer response. CP/M's Assembly Language Utilities are described for the non-technical reader who wants maximum use of CP/M's capabilities. The book also discusses how application packages, high level languages, solution programs, and other support programs combine with CP/M to answer a user's individual needs. You'll also find an explanation of MP/M and CP/NET as well as the technical aspects of CP/M's internal structure which will permit you to make simple modifications. A full glossary and several useful appendices are included.

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The Business System Buyer's Guide by Adam Osborne #47-0 $7.95 ☐

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CIRCLE 251 ON READER SERVICE CARD

Manager, continued...

Portable computers interest me as would any superior tool or method. If factual data proved that lop-eared kangaroos improved office productivity, this article would have a report on eight months of progress in *that* field!

Next I began talking to associates at work, including old friends and new contacts at a number of company locations. My research convinced me that if I had a small portable computer, and could learn to program it, I might move toward solving both problems—component productivity readiness-to-serve, and my own educational shortfall. A portable computer was necessary because I had to get most of my learning and project application development work done at home. The normal tasks had to continue during regular business hours.

After several passes at writing a proposal, I was ready to spend the equivalent of two days talking with my division experts and management associates, who would have to approve the purchase of a computer. It was a good two days, for I continued to learn as I answered their questions.

I was fortunate in having an open-minded boss, along with reasonable and considerate associates, who were willing to listen to my story, give useful advice, and in the end, approve my purchase. In fact I became the first manager to be involved in one of several experimental pilot projects with small portable computers now under evaluation. In keeping with my plan, I purchased locally—"don't forget service!"—an Apple II with clock card, two disk drives, a 9" black and white TV monitor, Micromodem for telephone connection, and a dot/matrix printer, along with a carrying case, some mini-floppy disks, and a few more books on programming. Soon I added the Applesoft floating point Basic language card, and an 80-column card due to growing word processing use. With company consent I carried the above home, and spent most of Christmas and New Year's vacation going to my own self-conducted school. My understanding wife began to wonder about the "electronic mistress" who kept me up late nights, but I knew I was a novice, and wanted to have some proficiency before installing the computer in my office.

Slowly, with plenty of mistakes, I learned how to operate my Apple and began writing and experimenting with simple programs. The owner and staff at the local computer store—Erie Computer Co.—were just great. As I think back about the really simple questions that had me stuck, I am amazed at how understanding and helpful they were every step of the way—even if I called at night.

Learning to make the computer work for me has been like taking a person who played beginner music on the piano years ago and giving him an organ for the task of playing Bach and Beethoven, and expecting him to compose additional music as well.

I found that it takes some time to learn the mental and manual habits of "playing" the computer. Each piece of software "music" requires learning and practice to remain proficient. In addition it can become frustrating to find that with every new piece of software comes *another* instruction manual.

I've found programming a bit like learning a foreign language; it is easier if you immerse yourself in the culture, in this case by writing short job-related programs yourself.

Frankly, I look forward to the day when we will have even higher level computer languages, and "smarter" computers that will take verbal instructions to do what one wants done.

It took me about a month of evenings and weekends before I felt confident enough to bring the Apple to my office, and have it work for me without my spending office time getting it to work. Over the following months I added one application after another.

At this point the computer is an essential part of my office life. It has proven itself invaluable, and in some ways I couldn't forecast. I'd feel lost without it. I've found it to be a practical way to "do more with less"—a situation very familiar to businessmen everywhere who are fighting off the ravages of inflation and America's rather shoddy productivity standing.

Now let's examine actual applications by looking at what I said I planned to do with the Apple in my purchase authorization last December and comparing that with actual use.

Purchase Proposal Item 1: As a "dumb" terminal, to access the manpower review data on the mainframe computer in Schenectady, via modem/telephone.

Results: This has worked out better than I originally thought due to a short "auto-dial" software program an Apple-using colleague helped me work out one Saturday at the office.

The old way was for a colleague to telephone, requesting candidates for a specific job he would describe. I would make notes on a pad, give them to an associate to search on the time-share terminal, or do so myself, then call the requesting party back, often to find him at a meeting. Usually a day or two of missed calls would pass, and if either of us had to travel, a week or so might be lost.

Now, with the special auto-dial software, when the call comes, I slip the program disk into drive #1, boot the system and it automatically dials the mainframe computer. The auto-dial program goes through six secret, and periodically changed, access codes and puts the Schenectady computer on line in about the amount of time it takes to cover the conversational pleasantries. With the phone tucked in my ear I can discuss candidate specifications and qualifications while I input the necessary search questions via Apple and modem. It prints out the list of candidates that most closely match the requestor's needs and I then turn the list over to an associate who pulls resumes and mails them off.

The matches of candidates to specifications are a little better because the caller and I interacted with the data base at the time of the request. The matter is settled at the time of the call. There are no return calls, no lost time, no notes lying around or misplaced and no delays. This initially unforseen auto-dial program has been a real gem. It represents an increase in productivity: readiness-to-serve is greatly improved and quality of results is higher.

However, I had also wanted to do an even more automated job by tying in the clock card to make end-of-month calls to the mainframe. During plant shutdown, the same associate, Lyn Brawn, who helped me develop the auto-dial program earlier in the year, helped me put this together. We call it TAP, for Time Auto-dial Program.

There were two reasons for not getting TAP finished several months earlier. First was a bad experience, when I left my computer to finish a long printout one evening, the output appearing to be neatly piling up on the floor as I locked the door and turned out the lights. The next morning, I found a terrible mess! Because the paper holders on the printer were set with too much lateral tension, the print head impact stretched the paper causing it to form a vertical column four feet high that looped back over the printer, caught on the paper feeding in, and got bound up. The print head merrily continued to bang away, totally disintegrating paper one line high and about 80 columns wide, and spreading blackened paper dust in the process.

Was I ever peeved and upset when that greeted me the next morning! "Try not pulling the paper too tight horizontally with the feed rollers," my computer store expert told me. That has cured the problem ever since—I think. But, it has left me a bit gun-shy.

The second reason is that earlier programming attempts showed there was considerable complexity in developing the program. As one indication, we finally solved a problem of lost characters in the tenth column of each incoming message by moving a subroutine to the front of the program. The time required for the TAP program to function had been interfering with the responses from the big computer! TAP now runs successfully, and here is what it does:

1) Friendly instructions on the TV screen show the user how to enter the time the call to the mainframe computer is to be made. This can be hours or days in the future, which is nice if you are leaving town.

2) At the appointed time, the Apple will call the mainframe and get it on line.

3) Next, it will go through the six secret

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CIRCLE 159 ON READER SERVICE CARD

Manager, continued...

codes to access the manpower information files.

4) It then asks a series of end-of-period human resource questions, getting answers and storing them to disk. I've got about 24 such questions that can be changed and are loaded in advance of running the TAP program.

5) Following that, TAP electronically hangs up the telephone.

6) Finally, if I have preselected the automatic print option, the Apple will print out the results which were stored on its disk. With fear in my heart, and a more relaxed setting on the printer's paper feed rollers, I've done it this way to save me time the next day.

This program is generally set to run at the end of each month, around 8:30 p.m. with no one in attendance. Previously, the process involved someone at the terminal during work hours or on casual overtime, when telephone rates and computer charges are higher. Productivity improvement is evident.

Purchase Proposal Item 2: Tracking analysis and reporting of recruiting activities, trainees, courses, etc.

Results: Okay to "okay minus." I later learned that this activity was called "electronic filing."

Supplied with the Apple was a free piece of software called "File Cabinet." After reading the short write-up I thought, "Oh boy, this is just what I want!" I typed in all manner of data that was stockpiled just for this event. But strange wipeouts occurred when I tried to manipulate the data. "It must be me," I thought. Only later, after repeated attempts and a couple of ruined weekends, did I learn there really were bugs in this "free" program!

Since then, I've tried other electronic filing software with a "once bitten, twice shy" approach. Some of my electronic filing information is conveniently stored in letter or memo form on word processing diskettes. I find myself drifting away from letterbooks and some other filing of paper, but I wish this area was in better shape. Perhaps some reader has had more favorable and time-tested experience he or she would be willing to share.

Purchase Proposal Item 3: Specific Analyses:

Results: Use in this area has been extensive, particularly in manpower modeling. Through a friend at corporate headquarters we unearthed a model done by Hal Hayes, who retired from GE a few years ago. It was written in Basic for timesharing. Starting with it, I made some minor math modifications in the program logic and translated it into Applesoft with helpful video instructions and sounds. This has been used in internal manpower studies showing projected impacts of different levels of business on numbers of employees by level.

Another friend visited with me for a half day a few months ago then went back and designed an even more precise model which I hope to translate to Applesoft for the next organization planning study.

As a virgin effort, I wrote a model that shows the number of people by layer in the organization. It differentiates managers, foremen/supervisors and individual contributors, and prints a "half a Christmas tree" pictogram at the bottom of the one-page printout, below the calculation/information lines. This was used in a special organization planning study.

A commercially available software package based on the Troll language—for Timeshare Reactive On Line Laboratory—has been used both to plot comparative curves of various manpower data and to do multiple regression analyses for internal studies. Apple-Plot software just arrived and I'm looking forward to using it soon for bar charts and graphs.

Purchase Proposal Item 4: Mini-studies

Results: Through Erie Computer Company, a human resources software package was developed that allows a comprehensive and flexible manipulation of employee data. This is a powerful package that will enjoy continued use.

It has been used for analysis of our advanced manufacturing engineering talent and in defining and tracking our key technologists, primarily in the engineering function.

Purchase Proposal Item 5: Report updates/word processing/office management.

Results: Word processing use has grown considerably beyond what I had first anticipated. To put it in perspective it helps to look at an executive's communication options. In addition to handwritten memos, notes on the incoming letter photocopied and sent as reply, phone calls, and personal visits, he can dictate, give handwritten copy to the secretary or steno pool, use centralized word processing or, as in my case, use the computer for some tasks.

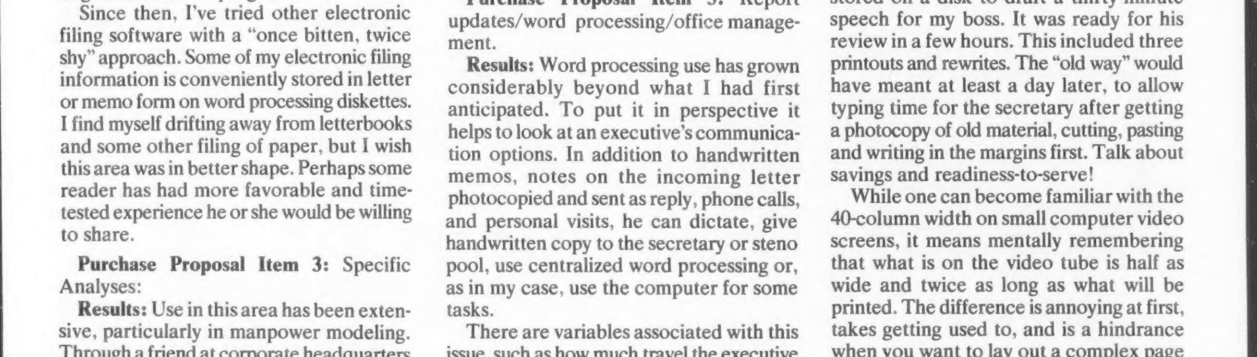
There are variables associated with this issue, such as how much travel the executive does, what internal mail delays exist between one's office and the central word processing unit if it is not in the same work area and, of course, personal habits and status concerns. These include whether the executive can or will learn new office work habits, can type, use portable or other dictation devices, writes drafts longhand, uses the secretary to administer more important projects, and ego ("I'd never be caught typing my own report"—to name a few highlights.

Without debating or justifying my position endlessly, here are a few observations: Author Alvin Toffler, in his latest book, *The Third Wave*, advises readers that as he learned more about the microelectronics revolution, which is one of the four key technologies of the future, he went out and bought a simple computer, used it as a word processor, learned to operate it in a few hours and finished the last half of his book that way. He says, "After more than a year at the keyboard I am still amazed by its speed and power . . . . This eliminates erasing, 'whiting out,' cutting, pasting, stripping, Xeroxing, or typing successive drafts". I concur, based on my portable computer experiences these past eight months.

Toffler also describes a futuristic advertisement for a group vice-president. After the normal requirements for such a position he adds the phrase "Typing Required." Get the point? Frankly, the executive who can type and use a small portable computer has a competitive advantage *today*!

What has rather naturally evolved for me is the increasing use of the word processing software. I simply find that of all the options available, I can do those letters requiring my thoughtful composition, reports, interview write-ups and speeches quicker and better myself. By way of example, I used portions of one talk already stored on a disk to draft a thirty-minute speech for my boss. It was ready for his review in a few hours. This included three printouts and rewrites. The "old way" would have meant at least a day later, to allow typing time for the secretary after getting a photocopy of old material, cutting, pasting and writing in the margins first. Talk about savings and readiness-to-serve!

While one can become familiar with the 40-column width on small computer video screens, it means mentally remembering that what is on the video tube is half as wide and twice as long as what will be printed. The difference is annoying at first, takes getting used to, and is a hindrance when you want to lay out a complex page with columns. To solve this problem, I bought the 80-column card and am now



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What's that? Sure, you can learn. Just get a copy of **Computers For Kids.** It's a super book, and it tells you everything you need to know. Huh? You have an Apple? No problem. There's a version just for the Apple. One for the TRS-80 and one for the Atari too, with complete instructions for operating and programming.

The book will take you through everything programmers learn. Its easy to understand and the large type makes it easy to read. You'll find out how to put together a flowchart, and how to get your computer to do what you want it to do. There's a lot to learn, but **Computers For Kids** has 12 chapters full of information. You'll even learn how to write your own games and draw pictures that move.

Just so the folks and your teachers won't feel left out, there's a special section for them. It gives detailed lesson ideas and tells them how to fix a lot of the small problems that might pop up. Hey, this book is just right for you. But you don't have to take my word on that. Just listen to what these top educators have to say about it:

Donald T. Piele, Professor of Mathematics at the University of Wisconsin-Parkside says, "**Computers For Kids** is the best material available for introducing students to their new computer. It is a perfect tool for teachers who are learning about computers and programming *with* their students. Highly recommended."

Robert Taylor, Director of the Program in Computing and Education at Teachers College, Columbia University states, "it's a good idea to have a book *for children*."

Not bad, huh? Okay, you can let the adults back in the room. Don't forget to tell them **Computers For Kids** by Sally Greenwood Larsen cost only $3.95. And tell them you might share it with them, if they're good. Specify edition on your order: TRS-80 (12H); Apple (12G); Atari (12J).

Your local computer shop should carry **Computers For Kids**. If they don't ask them to get it or order by mail. Send $3.95 payment plus $2.00 for one, $3.00 for two or more for shipping and handling to Creative Computing Press, P.O. Box 789-M, Morristown, NJ 07960.

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Solution, continued...

awaiting the arrival of its associated word processing software—and another instruction manual.

You may initially respond to do-it-yourself word processing with: 'What, me type?!" All I can do is report the foregoing facts, and advise you that I try to approach my job as though I were selling my services as an independent businessman. That is the acid test for deciding what is really efficient in a specific situation.

This article was done on my computer a bit at a time, often over the weekends when I frequently take the Apple home in its travel case.

As a further step toward better office management I obtained inexpensive commercial software which replaces the old hand-written "To Do" list. Many such software packages exist for under $50. While only a month into using it, and still adjusting my habits, it seems to be practical and helpful. It also allows one to enter advance dates such as quarterly reviews, employee service dates, birthdates, salary increase dates, etc., and provides early notice of same.

Another inexpensive commercial program stores several hundred names and telephone numbers, places and times calls, and prints a log of calls and a short telephone book. I group most of my outbound calls and find this program very helpful. A study of the log also shows a quarter of the calls were to parties not then present, which whets my appetite for electronic mail in the near future.

Summary

At the beginning of this commentary two objectives were mentioned—improving my component's productivity and readiness-to-serve and expanding my knowledge of computer applications.

While such evaluation is in part subjective, progress has been made on both fronts. I have no regrets and am pleased with the overall results. Objectives stated in the purchase authorization have generally been met, with some areas better and some a little short of the initial plan. And, there is still room for new and better applications.

As far as my education goes, you can conclude something about that from the above. I'll also tell you a little story. A couple of months ago I took a short Basic course taught by and for engineers here at the plant. I was able to not only keep up with the class, but could do the homework on the Apple. Some of the engineers came over and looked at my Apple set-up. That was a nice experience. I think I talk their language a little better and am a better human resource manager for technical associates as well.

I would appreciate letters from readers expressing questions, contrary findings or opinions, advice or ideas. I'm still learning. ☐

Whatever happened to eenie, meenie, miney, mo?
This may put the Godfather out of business.
I could be another Solomon…
If only my heart would stop racing…
It must use Bayesian, weighted factor analysis, and…
Brilliant! Like a window into the future.
…a perfect gift for that urban cowgirl!
Maybe this'll help me choose a career…
Would I rather have Winston's millions or Billy Joe's love?
I could use it to select my staff.
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The system is the solution – or is it?

Archie McGill

In the 1970s there has been an explosive growth in the use of small computers in homes and businesses. Most of these computers, used with add on devices and appropriate programs, can converse with another computer at a remote location. Initially, the telephone network provided a convenient means for exchanging information between two remote machines using a modem at each end. All such connections, however, were point-to-point. Further, since the telephone network is designed for low cost speech communication it did not meet all the needs of the Data Communications User. A proper data communications system should be more flexible, offer higher performance and be designed to do this economically.

Bell System was one of the first in the world to introduce a digital communication network service, Dataphone Digital Service (DDS)*, exclusively for the Data User. The DDS network improves upon the voice communication system for data transmission by offering network-wide timing, routing, maintenance and administration capability. This network, even though physically linked with the telephone network, is functionally separate. Before DDS, no end-to-end digital transmission facility existed. Portions of the voice network have been digitized since the early sixties. The gradual development of demand for digital transmission on the network made the complete digitizing of the voice network impractical.

DDS offers only private line point-to-point and private line multi-point services. It is only economic and for relatively large users with a fair amount of traffic between two or more fixed points. This is a rapidly growing market. But what about the smaller user who does not need such a high powered full time capability?

Networking will be sold by the ton or the ounce with optional easy-to-use features that allow the user to make intelligent choices between different modes of operation, equipment and applications.

The question of providing a network for the smaller user has attracted our attention and indeed that of other vendors for some time. Such a network should be as easy to use as the DDD network. However, it must support a variety of terminals and computers operating at a number of speeds and using different protocols. Unless a network could operate satisfactorily with a number of machines all using different protocols, its common user characteristics could be lost. More work is needed to simplify user interfaces. Further, since the user of such a network wants to pay only for what he gets out of it, a really responsive price would charge largely on the basis of the number of bits transported, or network processing resources consumed rather than on the basis of the connection time.

Network vs. Machines

I am often asked whether intelligence should reside in the network or in the terminal equipment in the future. There is no simple clear answer to this question. While trends of technology are generally known and predictable, how they will actually affect a user's way of doing business is not as easy to predict, even for the relatively near term. We can make some realistic and reasonable projections. I happen to believe that the intelligence of both the terminals and the network will grow in the future simultaneously. At any given time, a trade-off will exist for most applications, and the relative usage of network or terminal intelligence for a given application will depend upon the technological and market forces. We feel that having the Bell System in the marketplace gives the customer a choice of feasible ways to meet business and personal needs.

Private and Public Networks

The debate over the relative superiority of private and public or common user networks has been going on for several years. The truth is that neither one of these is or can be a replacement for the other. The Bell System is largely known for its common user telephone network,

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*Dataphone Digital Service is a Registered Trademark of AT&T

Archie J. McGill, Vice President, Business Marketing, AT & T, Basking Ridge, NJ 07920.

but we have been a major supplier of private networks as well. Private networks would be extremely limited if they had no means of communicating with each other. The public networks thus support the growth of private and special purpose networks. There are overlapping areas between private and public networks. This overlap is natural and desirable as it provides the users with alternatives.

Integrated and Segregated Networks

The Bell System is committed to serving the entire information market, not merely a piece or a segment of it. It is legitimate for the user to ask whether we will provide the entire spectrum of network-based services through one or many networks. From an engineering point of view, the question of one versus many networks is dictated by underlying costs of realizing applications in the different ways. That is our problem, not yours. From the market view, however, it is entirely possible to make the underlying network and its capabilities fully transparent to the user at the application level. This is the approach we intend to take for serving the users of our network services in the future. The use of this approach will be even more important in the future since it will permit the Bell System to introduce and use the most efficient technology at any given time without causing any disruption at the user's application level.

Future Directions

We see a variety of interconnection possibilities geared to the size, speed, sophistication and complexity of user needs. Networking will be sold by the ton or the ounce with optional easy-to-use features that allow the user to make intelligent choices between different modes of operation, equipment and applications. Most important, the 80's will bring a dazzling variety of choices to the computer user, and we intend to be one of the best. ☐

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"I'm on line, therefore I am."

Why would anyone spend $59.95 for a joystick?

Super Joystick

Star Wars. Played with paddles, it's difficult at best and frustrating at worst. But with a joystick it becomes an entirely new experience. It's still challenging. It's also fun. And very addictive.

Have you ever used a drawing program in which one paddle controls the horizontal movement of the "brush" and the other paddle the vertical? It's slow, tedious work. But with a joystick, drawing is an absolute joy.

Exceptional Precision

The Apple high-resolution screen is divided into a matrix of 160 by 280 pixels. To do precise work on this screen, you need a precise device. Most potentiometers used in paddle controls are not quite linear. If you rotate a paddle control at a constant speed, you'll notice that the cursor speeds up slightly at the beginning and end of the paddle rotation.

The Super Joystick has a pure resistive circuit which is absolutely linear within one tenth of one percent. In other words it would give you precise control over an image of 1000 by 1000 pixels, were such resolution available. Thus it is suitable for high precision professional applications as well as educational and hobbyist ones.

Matched to your application

The Super Joystick also has two external trim adjustments, one for each direction. This allows you to perfectly match the unit to your application and computer. Say you want to work in a square area instead of the rectangular screen. Just reduce the horizontal size with the trim control.

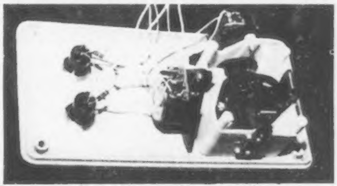
How many times have you played Space Invader and had your thumb ache for hours from the repeated button pressing? This won't happen with the Super Joystick. It's two pushbuttons are big. Moreover, they use massive contact surfaces with a life of well over 1,000,000 contacts. A few games of Super Invader using these big buttons will justify the purchase of the Super Joystick.

The Super Joystick is self-centering in both directions. That means when you take your hand off it, the control will return to the center. However, if you want it to stay where you leave it, self-centering may be easily disabled.

The Super Joystick plugs right into the paddle control socket and doesn't require an I/O slot.

High-quality construction

The sturdy metal case of the Super Joystick matches that of the Apple computer. Every component used is the very highest quality available. The Super Joystick even uses a full 16-conductor ribbon cable so you can add a second joystick if you wish. The first Super Joystick replaces Paddles 0 and 1. You may not realize it, but the Apple can support four paddle controls. A second Super Joystick would replace Paddles 2 and 3.



By removing two springs, self-centering can be defeated.

We invite your comparison of the Super Joystick with any other unit available. Order it and use it for 30 days. If you're not completely satisfied, return it for a prompt and courteous refund plus your return postage. You can't lose.

The Super Joystick consists of a self-centering, linear joystick, two trim controls, and two pushbuttons mounted in an attractive case. It comes complete with an instruction booklet and 90-day limited warranty. Cost is $59.95.

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Calling Information: Telecomputing with Personal Computers

Tracy R. Licklider

Is there really a vast world of information just waiting to be accessed from your personal computer keyboard as soon as you add a telephone interface? Is there really something at the other end of those phone lines worth calling up?

Well, the answer is basically yes. With just a phone call from your personal computer, a broad range of information and services is available today from the two major "information utilities"—MicroNET and The Source, from Dow Jones' News and Quotes Reporter service, and from local computerized bulletin boards. For example, you can get the latest news, sports, and weather from Associated Press, United Press, the Columbus (Ohio) Dispatch, or the Wall Street Journal. You can also get point spreads on NFL football games, recipes and their nutritional analysis from Better Homes and Gardens, personal astrology reports, advice on wines, movie reviews, guides to restaurants, US government publications, items from the New York Times Consumer Information Database, tips from Radio Shack and Atari about using their computers, and stock and commodities prices.

Besides access to the above information bases, the utilities and computer bulletin boards also offer electronic mail, electronic shopping, user-to-user "chatting," games, programs that you can "download" into your computer, and the opportunity to try programming in a dozen languages.

Response

Yes, this world of information and services exists today. The real question, however, is how useable and useful is it all? One aspect of useability is performance. How fast do these systems respond to your requests for information? The information utilities—The Source and MicroNET—are thinly disguised big computer timesharing systems. These systems can process simulataneous connections from scores of personal computer users, but, as more and more users log onto a system, its response to each user deteriorates. During peak useage hours in the early evening, these systems often become overloaded; they may allow more users onto the system than they can actually keep up with. It takes longer and longer to retrieve and display the information you want. The system may even start pausing noticeably in the middle of typing out individual words!

Besides a one-time sign-up fee, you pay a fixed amount per hour to use an information utility. The amount per hour is independent of how much computer service you really get. You pay the same amount when you are logged in with nine other users and getting one tenth of the system's attention as you do when you are logged in with ninety-nine other users and getting only one one-hundredth of the system. You are not guaranteed any minimum amount of service for your dollar. So, as long as users do not get so frustrated that they hang up and never call back, it makes moneysense to the utility to load as many users onto one system as possible.

However, it is not just the profit motive that tends to overload these systems. The consumer demand for these services is growing faster than the utilities can add computers. More and more people have personal computers; more and more of them are adding telephone interface capability. These people want to experience the future today and get access to the promised vast world of information on these systems. However, the information utility companies just do not have the money, organization, or technical expertise to grow at the pace that the demand grows.

These growing pains are very real. The Source, perhaps because it only charges $2.75 per hour, has suffered them far more severely than MicroNET, which charges $5 per hour. Still today response

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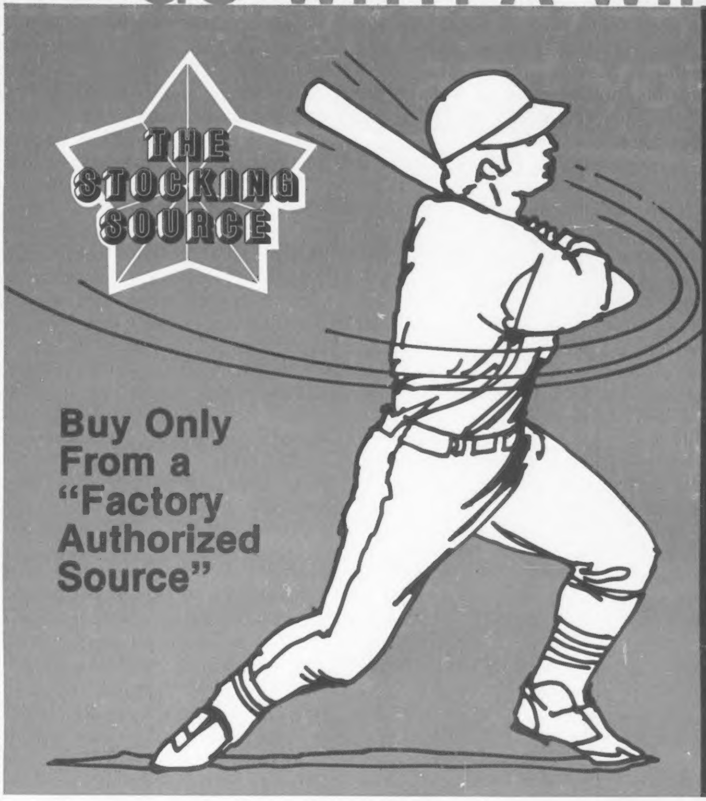

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on The Source is noticeably worse than on MicroNET.

Ease of Use

But system response time is just one factor in overall useability. It does not do you much good to log onto a fast, responsive system if you cannot find the information you want or if you cannot figure out how to play a game or get started programming in Pascal. How easy do these systems make it to do what you want to do?

The Source and MicroNET have taken quite different approaches to making it easy for the user to find his way. The Source has not really tried to present a consistent interface to the user. It does have "DATA" files that provide user documenation on how to use the major features and data bases. You type "DATA X" to get user information on X displayed on your screen. The trick is to figure out the right X for what you want. The command "DAT LIBALL" lists out a library of most DATA files. For example, it turns out that "DATA DANEWS" gets you instructions on how to access the UPI News database.

On The Source most databases (such as UPI News) have their own idiosyncratic conventions for accessing things. The way you find out the final score in the Dallas-LA game is totally different from how you find out about good restaurants in New York. Simply put, there has been no effort to homogenize the access methods to these various databases. While there are some arguably good reasons for this approach, it does mean that the user has to learn new access rules for each database he uses.

MicroNET started out much like The Source. Originally, MicroNET offered fewer and weaker services than The Source in the same kind of hodge podge access environment. However, for sometime now, MicroNET has been building an outer layer—its Compuserve Information Service—of databases and services with a consistent set of access rules. Now when you log into MicroNET you start at this outer layer. You still have to leave this layer and jump into MicroNET to get at some databases and services, but most of the newer ones are accessible in this outer layer where the interface is consistent, simple, and friendlier to the information consumer.

Menus

The MicroNET outer layer is divided into lots and lots of very small pages. Each page is formatted into a dozen or so lines of about 32 characters. The starting page and many other pages are organized as menus of lists of choices. For example, the first page you see presents you with eight choices. One choice jumps into the wilds of unpaged, old-style MicroNET. The other seven choices lead you into broad general areas such as news, finances, games, electronic mail, and special features. Making any of these seven possible choices gets you a new page with a list of choices appropriate to the general area you picked.

Successively you make choices from menus and sub-menus until you get down to the specific information you are seeking. For example, to get the point spread on the Giants-Redskins football game, you pick the special features choice at the top menu, then the pro football choice on the special features menu, and then the pro football menu. At this point, the point spread feature menu would present you with a list of the National Football League divisions and ask you to choose the one you wanted. You would have to know what division the Giants or Redskins were in and choose that option. Finally you would be shown a page of information—not a menu page.

Descending through the successive menus can be tedious, but at least it is simple and consistent. You use the same access method to get the news, recipes, financial reports, tips from Tandy and Atari, how to adapt MicroNET to interface to your computer, and a wide variety of other information. A menu never has more than ten choices, and you only have to key one character to make your choice. The digits 0-9 choose the displayed options 0-9 (usually, however, there are fewer than ten choices). The letter T jumps back to the top (log-on) menu of choices. The letter M jumps you back to the last menu you descended from. The letter P redisplays the last page displayed before the current one. Pressing the letter N or the RETURN key shows you the next page following the current one. The letter G followed by a page number goes directly to that page.

Originally, MicroNET's page numbers were just that, numbers. For example, page 28 used to be the jump off point into unpaged MicroNET. If you proceeded to the next page from this point, you left the simple, consistent world of page numbers. To eliminate the tediousness of descending down through the menus to find certain databases and features, MicroNET has recently added a new kind of mnemonic page number for many of its features. For example, page "number" ATR-1 is the first page of the current Atari newsletter, BHG-1 is the first page of the current Better Homes & Garden features. By typing the letter G and the page number ATR-1 at the top menu page, you can jump directly to reading the Atari newsletter. It is still paged as before; the only thing that is different is how you get there.

While there are still many features and databases that you cannot access in this paged way and while MicroNET's approach is far from perfect, such efforts in providing a simple, consistent access mechanism are crucial to having a worthwhile and useable information utility.

Information Indexing Schemes

In spite of the niceness of MicroNET's menu-sub-menu approach, trying to find a news story on a particular topic will readily convince you that there is still a long way to go before the access mechanisms are satisfactory. For example, to find the latest news story on developments in El Salvador, you descend down the menus until you pick national and international news from the Associated Press wire service. From this point, you are presented menus—usually full with 10 choices—of news stories. Each line of the menu, representing a story you might choose, has a one or two word title. Some are as definitive as "War" or "Earthquake". Other titles provide a bit more of a clue such as "Polish Strike" or "Linowitz." With such meager titles or descriptions of your choices, it is easy to miss stories about the particular topic you are searching for.

The UPI News Service on The Source offers a much more powerful retrieval capability and demonstrates how some kind of indexing or keyword scheme for accessing specific information is essential. UPI news stories are categorized by the UPI when they are entered into its computer system (which feeds into The Source). The categorization scheme is not very rich, but it does divide national news from local news and news from sports. To get news from the UPI offering on The Source, you specifiy one of UPI's broad categories, a range of dates, and keywords you want to find. Continuing the earlier example, you might specify the keyword EL SALVADOR to get news about the situation there. You can specify multiple

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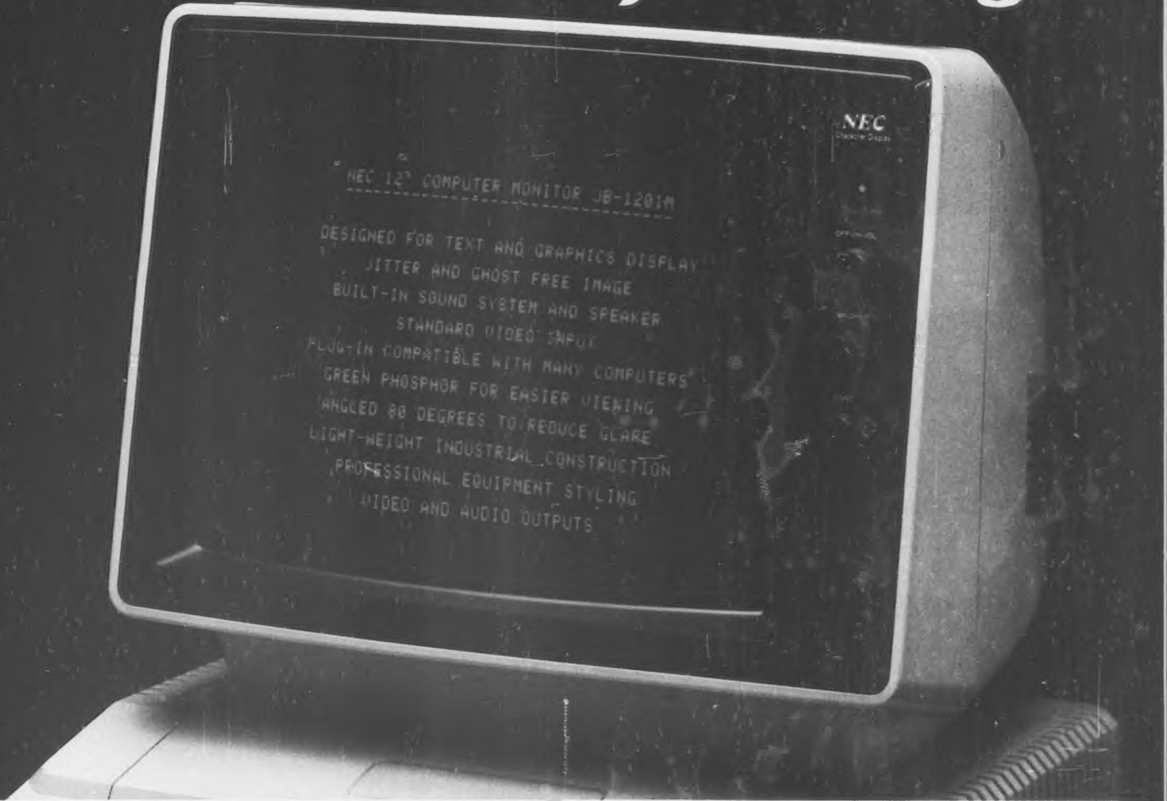
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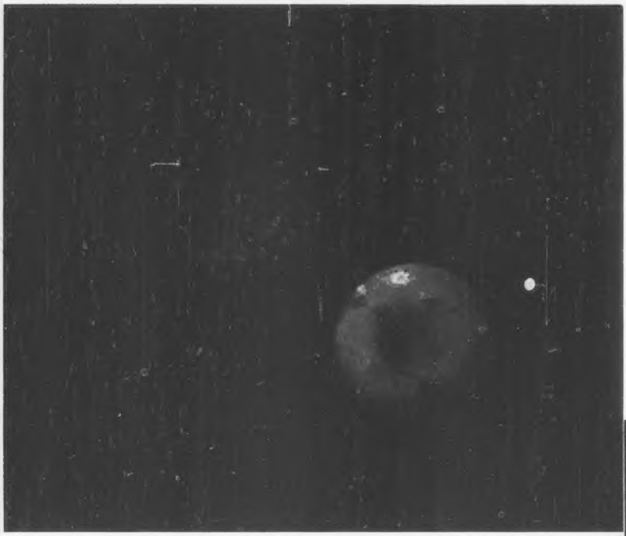

MISSION: ASTEROID
HI-RES ADVENTURE # 0

MISSION: ASTEROID is an introduction to the HI-RES ADVENTURE family of games. This adventure is slightly easier and a little shorter than our other HI-RES ADVENTURE games. MISSION: ASTEROID is designed to acquaint beginning Adventure players to the wonderful world of Hi-Res Adventure.

In this adventure you find that an Asteroid is about to hit the Earth and destroy it. It is your mission, as an Astronaut, to rocket to the Asteroid and blow it up before it reaches Earth.

OVER A HUNDRED HI-RES PICTURES. (Looks great on b/w and color televisions).

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In this particular HI-RES ADVENTURE game, you are transported to the front yard of a large, old victorian house. When you enter the house, you are pulled into the mystery, murder and intrigue and can not leave until you solve the puzzles. Your friends are being murdered one by one. You must find out why, and who the killer is. Be careful, because the killer may find you! As you explore the house there are puzzles to be solved and hazards to overcome. The secret passage way may lead you to the answer.

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keywords, in which case all of the specified keywords must occur in the news stories found.

The UPI system then scans all stories in the specified category and in the date range. It tells you how many stories were found containing your keywords and lets you scan or read through them either latest first or earliest first. With this approach, you are far less likely to miss a news story about El Salvador. Nevertheless, this approach has its drawbacks. Since the stories about El Salvador are not really stored in the database under the keyword "EL SALVADOR", the system has to do a lot of work to scan the full text of all news stories within the broad category and the date range to see whether the words "El Salvador" occur in them. This burdens the information utility computer and slows reponse.

Access Intelligence in the Micro

The Dow Jones News and Quotes Reporter service is another information utility—but one with a much more limited scope. It offers stock quotes and news about particular stocks and business sectors. The Dow Jones service seems to guard better against system overloading and maintains a reasonable response level. Moreover, it takes an interestingly different approach to the problems of database access. To use the service you have to run a special program in your personal computer; currently this News and Quotes Reporter program is only available for the Apple II.

The program provides intelligence at the personal computer end; the program knows how to phrase requests for information from the Dow Jones databases. Because the program in the Apple has this knowledge, what the user has to type to access particular information can be simplified. Basically, all you have to type in is a six or fewer letter code for the stock or business sector that you want quotes or news about. The program running in the Apple converts this code into a request for information and sends the request to the Dow Jones computer. Like Compuserve, Dow Jones returns pages of information. Some pages are menu pages which give two letter codes and two line headlines for specific news stories or stock quotes; other non-menu pages dieplay the quotes and news stories.

News on the Dow Jones system comes from the Wall Street Journal and from Barons. With this system you will still have a hard time finding the latest news about El Salvador, but you will never miss the stories about IBM or AT&T.

It is perhaps somewhat unfair to compare the Dow Jones service to The Source and MicroNET. No one is playing Adventure or compiling a Pascal program on it. Nevertheless, their approach—based on their indexing scheme with their own stock and business sector codes, their simplified and consistent method for requesting information, and their putting intelligence into the personal computer—is a model for other would-be information providers to consider seriously.

Programming & Games—On What?

A lot of people think that by signing up with an information utility they will be able to access games and programming languages to be used on their own personal computers. This is largely a misconception and can be the cause of big disappointments. Virtually all of the games (such as Adventure) and programming languages (such as COBOL) available on a utility can only run on the utility's big computer. There is no way to copy these onto your computer, then hangup, and play or program away. Even if you could copy them, they would not execute on your computer since they generally exist only in machine language native to the utiltiy's big computer.

Generally speaking, it does not make sense for the information utility to offer things for you to copy into your computer and then hangup. The utility makes money while you are connected and may be secretly happy when you stay logged in longer because you are lost in an Adventure maze or because your COBOL program is stuck in an infinite loop. While the rule is that games and programs are to be run on the utility's computer, there are a few exceptions. MicroNET has a "software exchange"—you exchange money for this software that will run on your personal computer.

Unfortunately, the offerings are rather meager. There are a few public domain programs that you can copy for free, but they are not very useful. You can skim through rather short descriptions of the for-sale programs. If you choose to copy one, your account gets billed the stated amount. The real problem is that copying a program over a phone line is not all that reliable. To do it without transmission errors, both the utility and your computer have to use the same error-detecting/error-correcting transmission protocol. MicroNET sells such a program that runs on Apples, TRS-80, and CP/M systems for essentially the cost of the media and handling. The Videotex software that Radio Shack sells for its computers and for Apples will eventually also support the MicroNET protocols for "downloading" programs and data into your personal computer. While this area of downloadable programs is rather undeveloped now, it is likely to develop significantly over the next couple of years. Wouldn't you be willing to pay a small fee to download a copy of the programs you see printed in the microcomputer magazines rather than have to type them in yourself?

Computerized Bulletin Boards

Up till now the focus here has been on commercial (pay-for-access) information utilities, but also out there at the other end of the phone lines are 100 or so free-access computerized bulletin board systems (CBBS). Virtually all of the CBBS run on single-user microcomputers—mainly TRS-80s, Apples, NorthStars. These systems have been set up by individuals and computer clubs, and a few are operated by stores. Accessing some of the more popular CBBS can be very frustrating—the one phone number to call is almost always busy. On the other hand, if you do get through, response on these systems is generally better than on the commercial utilties—you are the only user!

The CBBS do not offer the same broad range of databases and services that the commercial utilities do. For most of these systems, their only database is the current "bulletin board" of messages posted by other callers. Typically you can get a summary of the current messages as well as read and write messages. Most messages are readable by anyone, but some systems let you protect a message you post with a password. This way you can leave a private message for someone provided that you and the intended recipient have previously agreed upon the password to be used.

Because the CBBS run on microcomputers, they often have limited disk capacity to hold messages. The average capacity runs around 200 active messages. Usually messages are forced to be 16 or fewer lines—roughly a maximum of 1000 characters per message. Each CBBS establishes its own audience over time. The TRS-80-based boards generally attract TRS-80 enthusiasts and carry the latest bug reports, patches, news and information about TRS-80 hardware and software. Similarly the Apple boards attract Apple aficiandos. Other CBBS are focused on particular topics, clubs, or products; there is a genealogy CBBS in Virginia and one for engineers in Kansas.

The CBBS pre-dated the arrival of the commercial utilities, and when they started up, The Source and MicroNET both capitalized on the popularity of these CBBS by offering what they billed as national bulletin boards. While bulletin boards have offered the personal computer user a limited kind of electronic mail, the Source and MicroNET have added real electronic mail services with unlimited message length, better message editing, composition, and filing capabili-

Telecomputing, continued...

ties, private mailboxes, and notification when the recipient has read the mail you sent. Of course, the people to whom you send electronic mail have to be subscribers to the utility too.

Programmed Calling

Another drawback is that, as the number of CBBS and utilities grows, you have to log into more and more systems just to make sure that you pick up all the electronic mail and bulletin board messages posted to you. There is no inter-utility mail consolidation arrangement now, but eventually there may have to be. In the near future, there will probably be an increase in the number of people adding auto-dial capability to their personal computers. These people will program their personal computers to call the assorted utilities and local CBBS and pick up the mail. The computers will do the calling unattended in the middle of the night or when rates are cheapest.

Unattended calling by the personal computer points out another important area that the utilities and CBBS have seriously neglected. They have not made it easy to write programs to perform unattended access to their databases and services. For example, you might want to give your personal computer a list of things to check or look up on the utilities to which you subscribe. While you are asleep you might want it to call The Source, MicroNET, and local CBBSs to pick up any mail posted for you. In addition, you might want to scan the MicroNET Software Exchange to see whether there have been any program additions and if so have your computer pick up the descriptions. You might also want to have the computer "clip out" any news stories about some specified set of topics.

While some people already have their personal computers set up to do this today, the utilities are not currently set up to make writing or running such dark-of-night programs easy. The prompt and error messages are designed for human readers not for programs. Nevertheless, these access programs running in personal computers will become commonplace in time. It will mean building knowledge about the databases, services, and request protocols into the personal computer programs, and it will require improved, computer-understandabale prompts and error codes from the utilities.

Auto-Answer

Of course, an alternative service, which may also develop in time is for the utility to collect up your mail and clip the news stories of interest to you—based on some profile that you maintain about your interests on the utility. Then, in the dark of the night, the utility would call your personal computer, go through some handshake, download into your personal computer the stuff it had collected, and then hangup. This assumes that your personal computer can answer the phone by itself. When you wake up, you have your mail and personally clipped news file to read over breakfast.

Be a Pioneer

While they are still in the pioneer stages and while they still are experiencing growing pains, the information utilities offer substantial enough services to be worthwhile to many personal computer users. They are still no substitute for buying the New York Times or listening to the hourly news on the radio if you want to follow the major news items, but they can be worthwhile for tracking more obscure or special interest topics that do not make it into print or into the five minutes every hour on the hour. The utilities still have a good way to go to improve performance and ease of use; nevertheless, the range of their existing services and those of the CBBSs—especially databases about personal computers—may help you decide to buy that telephone interface board and telephone coupler. And once you have made that investment, you may find your personal computer asking for a phone of its own. □

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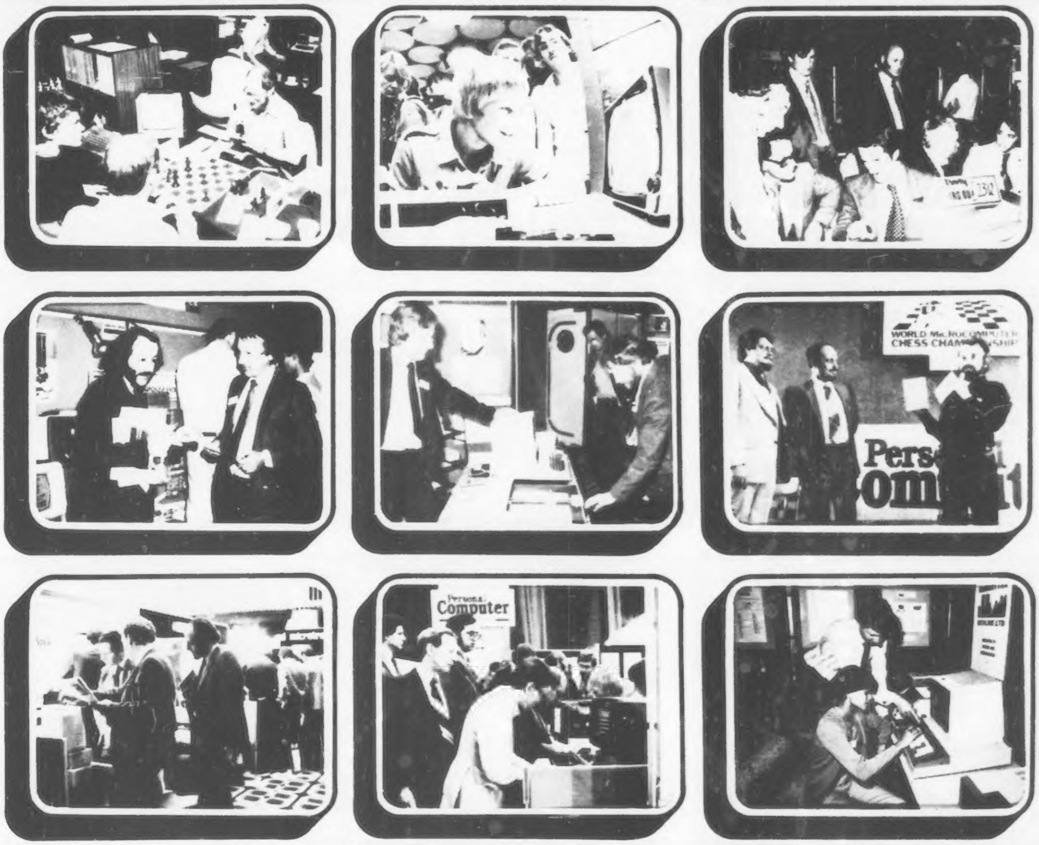
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The networks in use today are bringing us ever-closer to the total home information system. Home banking—perhaps as described here—will undoubtedly be a part of this system of the future.

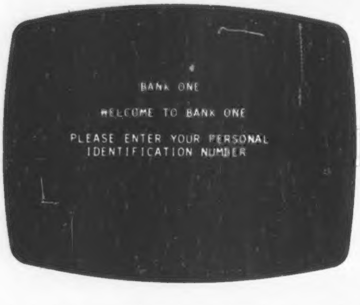
The Future is Here ...and it's on TV

Bill Streeter

It's mid-October, 1980. We're in the kitchen of a modest split-level somewhere in Columbus, Ohio, watching a housewife try out a new product. She's explaining what the little device is she's holding. . . .

"It looks a lot like a hand-held calculator except for the cord sticking out of the top of it. And some of these keys are a little unusual like, JUMP, and DO IT. The box with the phone receiver attached to it is some sort of decoding device.

"According to the users manual, if I press these buttons, like that, look what comes on the television screen:

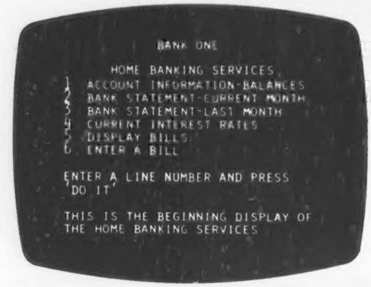


```
BANK ONE

WELCOME TO BANK ONE

PLEASE ENTER YOUR PERSONAL
IDENTIFICATION NUMBER
```

"Okay, I'll enter my personal identification number—that's my secret code; now let's see what happens . . .



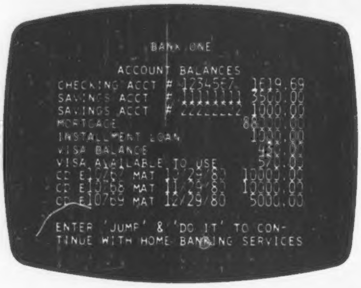
```
BANK ONE

HOME BANKING SERVICES
1 ACCOUNT INFORMATION-BALANCES
2 BANK STATEMENT-CURRENT MONTH
3 BANK STATEMENT-LAST MONTH
4 CURRENT INTEREST RATES
5 DISPLAY BILLS
6 ENTER A BILL

ENTER A LINE NUMBER AND PRESS
'DO IT'

THIS IS THE BEGINNING DISPLAY OF
THE HOME BANKING SERVICES
```

"First, I'd like to see my balances, so I push 1 and DO IT . . .

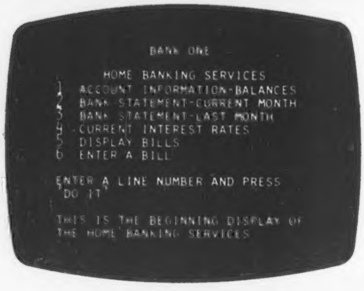


```
BANK ONE

ACCOUNT BALANCES
CHECKING ACCT # 1234567  1619.69
SAVINGS ACCT  # 11111111 3500.00
                ********
SAVINGS ACCT  # 22222222 1000.00
MORTGAGE                88000.00
INSTALLMENT LOAN         1000.00
VISA BALANCE              430.00
VISA AVAILABLE TO USE     570.00
CD E10767 MAT 10/29/80  10000.00
CD E10768 MAT 11/29/80  10000.00
CD E10769 MAT 12/29/80   5000.00

ENTER 'JUMP' & 'DO IT' TO CON-
TINUE WITH HOME BANKING SERVICES
```

"Good, that's about what I thought was in my checking account. Now, I'd like to pay a few bills, so I push JUMP and DO IT and that should bring back the index . . .



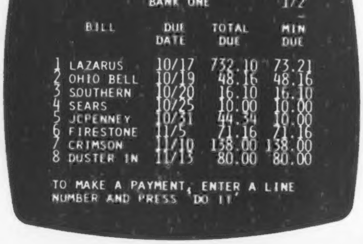
```
BANK ONE

HOME BANKING SERVICES
1 ACCOUNT INFORMATION-BALANCES
2 BANK STATEMENT-CURRENT MONTH
3 BANK STATEMENT-LAST MONTH
4 CURRENT INTEREST RATES
5 DISPLAY BILLS
6 ENTER A BILL

ENTER A LINE NUMBER AND PRESS
'DO IT'

THIS IS THE BEGINNING DISPLAY OF
THE HOME BANKING SERVICES
```

". . . which it does. If I want to see the bills the bank is holding for me, I push 5 and DO IT . . .



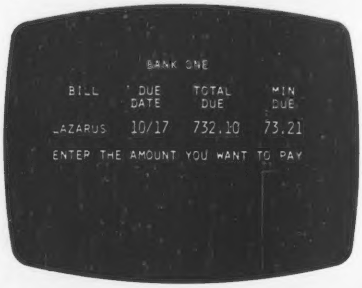
```
          BANK ONE            1/2

  BILL        DUE    TOTAL    MIN
              DATE    DUE     DUE

1 LAZARUS     10/17  732.10  73.21
2 OHIO BELL   10/19   48.16  48.16
3 SOUTHERN    10/20   16.10  16.10
4 SEARS       10/25   10.00  10.00
5 JCPENNEY    10/31   44.34  10.00
6 FIRESTONE   11/5    71.16  71.16
7 CRIMSON     11/10  138.00 138.00
8 DUSTER IN   11/13   80.00  80.00

TO MAKE A PAYMENT, ENTER A LINE
NUMBER AND PRESS 'DO IT'
```

"I'll pay the Lazarus bill first. I push 1 and DO IT . . .



```
              BANK ONE

  BILL      DUE     TOTAL     MIN
            DATE     DUE      DUE

LAZARUS     10/17   732.10   73.21

ENTER THE AMOUNT YOU WANT TO PAY
```

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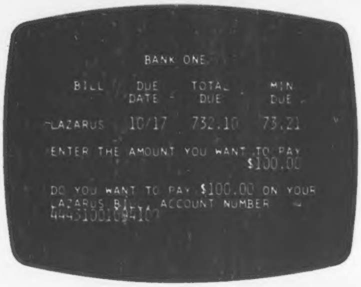
Bill Streeter, 350 Broadway, New York, NY 10013.

"I want to pay $100, so I enter 1 0 0 0 0—there's no decimal point—and DO IT, and we get . . .



```
BANK ONE

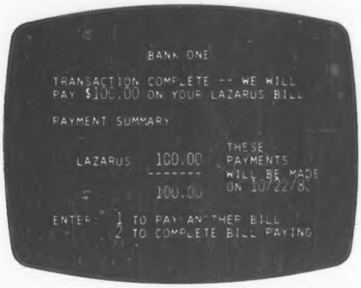
BILL      DUE      TOTAL      MIN
          DATE     DUE        DUE

LAZARUS   10/17    732.10     73.21

ENTER THE AMOUNT YOU WANT TO PAY
                              $100.00

DO YOU WANT TO PAY $100.00 ON YOUR
LAZARUS BILL, ACCOUNT NUMBER
4443100109410?
```

". . . this picture. It's just confirming what I want to pay. If I push NO, it starts over, but it's okay, so I'll push YES, and . . .



```
BANK ONE

TRANSACTION COMPLETE -- WE WILL
PAY $100.00 ON YOUR LAZARUS BILL

PAYMENT SUMMARY

                          THESE
   LAZARUS    100.00      PAYMENTS
              --------    WILL BE MADE
   =          100.00      ON 10/22/80

ENTER:  1 TO PAY ANOTHER BILL
        2 TO COMPLETE BILL PAYING
```

"Well, that was easy. Let's do another one. . . ."

Welcome to the world of banking from home. The numbers we just showed were all hypothetical. But if you were one of 100 volunteer families in the Columbus area, you could be running through that sequence for real right now—in your living room, your den, or wherever you had a telephone and a television set.

Is your curiosity piqued? If the people at Banc One Corp. in Columbus are any gauge of the future, it *ought* to be.

Says John F. Fisher, senior vice president of the $2.6-billion-asset bank holding company: "Home banking represents *the* most significant change in banking delivery systems, and the greatest opportunity to be responsive to market needs and to impact the economics of delivering banking services."

Show me. To bankers still waiting to install their first automated teller machines, that may seem a bit extreme. After all, point-of-sale banking, another highly touted retail electronic banking service, has proven difficult to implement profitably; at least the way several banks have structured it, not least Bank One of Columbus, the lead bank in the holding company. What makes banking from home any different?

Good question. Here's what Fisher says:

"It's a question of convenience and lower cost. Look at the Detroit automakers; they didn't protect the American car buyer from the high cost of fuel so buyers turned to the high-mileage imports. Likewise, going to the bank is an expensive way to do one's financial business," Fisher observes, "and society is becoming attuned both to sophisticated delivery systems—ATMs are one example—and sophisticated financial services—such as money market funds."

Granted, he says, there remain a lot of people who don't want to change—at least not yet.

Given all that, when will the demand for home banking services materialize?

"We're really quite early in the process," Fisher reflects. "Remember, it took 20 years for credit cards to mature. It also took 10 years for ATMs to mature. Certainly it will take most of the '80s for home banking to develop.

"We're at the same point with this new service right now as we were with credit cards in 1965–66, or with ATMs in 1970–71."

What now? Given that timetable, some banks may wonder what they could do now to be ready for home banking.

"They need to have their back rooms automated to an advanced state," advises Fisher. "And if they haven't installed ATM's, they had better catch up."

Before too long, he adds, a bank could begin to make commitments with some of the players in the home banking field. There are essentially three:

(1) *Vendors*—the manufacturers of televisions, special function terminals, and related devices;

(2) *Communications companies*—Ma Bell possibly, but more likely the private leased-line networks; and

(3) *Software developers.*

Fisher is concerned that banking won't get its share of computer brains who are now in short supply.

That could come to pass if banking as an industry adopts a wait-and-see attitude while a few institutions do the pioneering work.

"Everybody ought to lead," responds Fisher. "But banking is not a courageous industry, and this has contributed to its loss of market share to other types of institutions. In fact, banking is looking more and more like a railroad."

Centerpiece. Banking from home is just one part of a much larger development: home information systems. No one function—such as banking—can create sufficient demand to spur the development of home information systems, according to Fisher. It requires the commingling of multiple services and data bases.

But, he says, transaction applications can be the centerpiece of this emerging industry, and banks could be the ones to get it going.

So could retailers.

Whoever did the leading would be in a better position to shape the infrastructure than those who came in later as an add-on to an established system.

Right now, the infant home information industry is bustling with pilot projects, studies, and conferences both here and in Europe.

In the U.S., however, Channel 2000—the name for the Columbus project—is the furthest advanced of any home information project that involves banking applications.

Joint effort. Banc One did not create Channel 2000 on its own. The project is a joint effort between the holding company and a library services company called OCLC, Inc., which is also based in Columbus. Of its 21 affiliate banks, only Banc One Corp.'s lead bank is participating in the Channel 2000 test.

OCLC (the name was originally Ohio College Library Center) operates an on-line computer network used by over 2,000 libraries in the U.S. and Canada. Terminals in these libraries access a large data base in Columbus containing information on books and other library materials.

Channel 2000 will operate on a "strip file" basis (also called memo posting) in which home banking transactions are accumulated until the end of the day when they are transmitted to the bank to update its master files. At the beginning of each day, customer balance information is transmitted back to the Channel 2000 computer. The balances customers see on their tv screens, therefore, are the posted balances from the night before.

How bill paying works. The bill-paying function of Channel 2000 is a bit of a jury rig for the purposes of the three-month test. It can be handled two ways.

(1) The customer can batch together bills he receives and mail them to Bank One where they are entered into the bank's computers. When the customer decides to pay these bills, they appear on the tv screen (as illustrated at the beginning of the story).

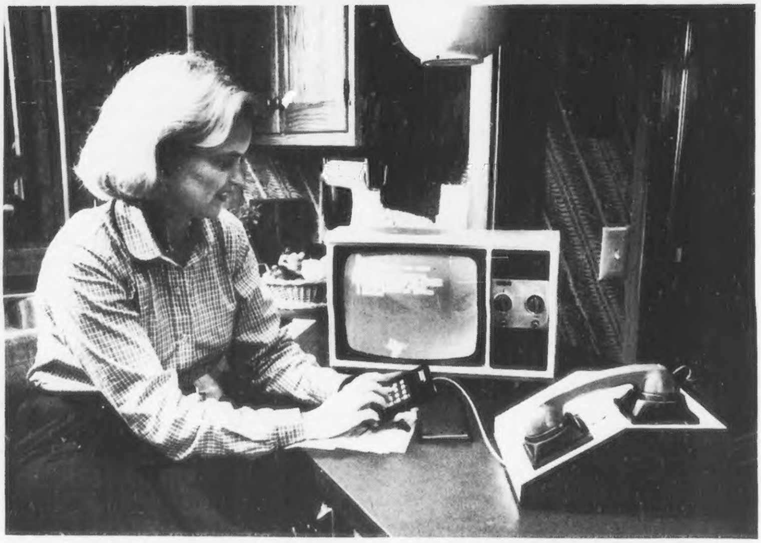
(2) A customer who elects to hold onto certain bills may enter them into the home banking system and instruct the bank to pay them. (The screen will list those bills that can be paid this way; some bills must be paid by check.)

Back at the bank, bill paying instructions from Channel 2000 users result either in a check being written for merchants which do not have accounts with the bank, or, for those that do, a transfer of funds from the customer's account to the merchant's account.

"Eventually," says Fisher, "we must have an automated way to send and receive data to and from billers. I'm hopeful the automated clearing house network will provide the missing link."

At the household end of Channel 2000, a user's telephone provides the link with the system's computer. It, in turn, is connected to the television with a device called a decoder. Essentially, it is a telecommunications device with computing capabilities.

To use Channel 2000, the customer dials a special number, waits for a high-pitched tone, then inserts the phone receiver into a coupling on top of the decoder (see photo). With the connection made, the customer controls the process using a handheld key pad.



Phone vs. cable. Banc One has been working towards a home banking system since 1975. For a long while it focused on a cable-tv-based system rather than one that relies on a telephone link. But negotiations with Warner Communications, whose two-way cable system called QUBE has been operating in Columbus for several years, never clicked, so Banc One shifted its strategy.

Fisher thinks cable could be used as a home banking mechanism in certain areas although he points out that not all metropolitan areas are wired for cable yet. Also, not all the cable that is in place is capable of interactive or even limited two-way communication. In any case, who the communications supplier turns out to be, or what the vehicle will be, is not that important, according to Fisher. However, he doesn't think *banks* will be providing this function.

What he sees as banks' key role is to establish switching and processing centers which would act as clearing houses for home banking transactions in a given area. These would operate much the way the so-called computer switches operate in shared ATM networks, routing transactions to the appropriate financial institution and maintaining certain financial data in its own computer.

We're at the same point with home banking now as we were with credit cards in 1965–66.

The link between these switch and processing centers and individual homes, says Fisher, would be provided by communications suppliers which would also be able to access other data bases so that the customer has access to a full range of services.

"I hope," says Fisher, "that the financial industry extends itself to become the principle operator of these switch and processing centers rather than a third party. It would require the same sort of coordinated effort as was needed to set up the national card associations."

Fisher doesn't believe the card associations will be the vehicles to establish home banking. "They're having a tough enough time establishing the debit card." Neither will it be the ACH network, although that will be involved. Something new will be invented, Fisher speculates.

Other features. Channel 2000 is a testing ground for more than home banking functions. Other services include:

(1) The first electronic library card catalog which allows users to select books from the television screen, check them out electronically, and have them delivered to their homes.

(2) A video encyclopedia published by Arete Co., Princeton, N.J. It contains 32,000 articles in electronic form, of which one third (in an ongoing program) will be updated annually.

(3) Public information about city, state, and private organizations assembled by Com-tility, a local non-profit organization.

(4) Columbus regional information—a calendar of events—assembled by the Chamber of Commerce.

(5) Math That Counts—basic mathematics for children. This and the following item were prepared cooperatively by the Ohio State University and the Columbus Teacher Corps Project.

(6) Early Reader—aimed at preschoolers.

(7) Deaf Community Bulletin Board provides educational and

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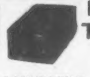

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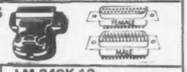

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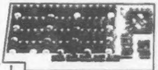

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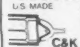

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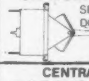

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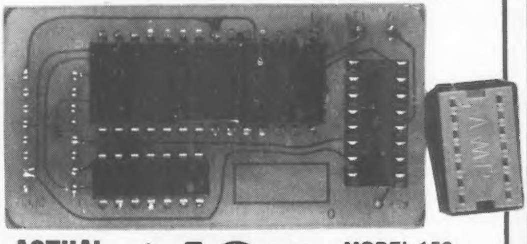

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CIRCLE 146 ON READER SERVICE CARD

Alternatives for Home-Terminal Folk

The Channel 2000 pilot is using standard television sets for its in-home terminals, but that isn't the only alternative customers will have. Banc One Corp. Senior Vice President John Fisher predicts three levels will evolve:

(1) **Personal computers** for upper-income households with needs for large amounts of computing power. These units will of course be able to communicate with home information systems as well as between themselves (this is already happening).

(2) **Stand-alone videotext** devices. These are essentially video terminals with some computing power and communications capability. They can be attached directly to a phone line. Already popular in Europe (particularly in France), these units will become the most popular home information terminal in this country too, Fisher believes. (Radio Shack recently announced a videotext model that retails for $399.)

(3) **Standard television sets** as used in the Channel 2000 test. "We're starting with this now," Fisher says, "but eventually I see this alternative as being used by households with more limited information needs." It's possible, he adds, that tv manufacturers will begin to build in the necessary communications devices as demand increases.

All this will take time, Fisher admits. Right now, "we're toe'd up to the threshhold."

community messages for the deaf.

The Channel 2000 project began operating the beginning of October and will run through the end of the year. Then OCLC and Bank One will evaluate the results and decide what to do next.

Fisher declined to speculate exactly what the next step will be, or when it will come, but he intimated that a second pilot will begin at some point incorporating changes suggested by the first.

Wanted: users. Altogether, 200 households are participating in the present test. Half were selected by Bank One from its customers, half by OCLC.

According to Fisher, all those selected by the bank had volunteered to participate. "We weren't interested in demographics," he says. "We wanted to get users; to find out what they liked or disliked about the system as it was designed. We weren't interested in trying to coax people into using it. Maybe three or four years from now we'll go after those people who are not inclined to use such a service now."

There is no doubt a home banking service will start out as an upscale offering, Fisher says, but it will work its way down quickly.

"That's been true of every delivery service—including checks." Fisher notes. "I see it eventually as a mass delivery system."

What and when. From Bank One's viewpoint the Channel 2000 test is a chance to get "root understandings" verified. For example:

When will the customer perform these home banking transactions; what are high-traffic times?

What other banking services should be offered as part of Channel 2000? (One idea is a budgeting function that would allow comparisons with other households of comparable income levels.)

What is the customer willing to pay for this service?

Home banking will stretch to the limit existing security and privacy measures.

How much will it cost the bank to offer this service?

What are users' reactions to security and privacy considerations?

How secure? That last point is particularly significant. A lot of financial data is being sent into people's homes with this service, says Fisher: "We want to find out how much concern there is about inappropriate access to this data."

Channel 2000's banking functions are protected two ways.

First, each member of a participating household has a PIN which must be entered before any financial data is displayed. One user cannot access his banking records from another user's decoder. The decoder is portable, however.

Second, all data travelling over the phone lines between the decoder and the system's computer is encrypted.

Nevertheless, Fisher believes that Channel 2000, and other home banking services, will stretch to the limit existing security and privacy measures. Fisher himself has long advocated a replacement for the PIN systems which he feels are inadequate.

Regulatory issues. Is Channel 2000 clear of all federal and state regulatory and legal hurdles? The bank sees no problems on that front and has received no challenge to date.

Leaving nothing to chance, however, Banc One and OCLC people trekked to Washington in September and set up a hands-on demonstration of Channel 2000 for the members and staff of both the House and Senate banking committees.

The purpose was simple: To avoid getting into an adversary situation, it would be helpful if legislators had first-hand experience of a concept that will undoubtably come under legislative scrutiny at some point. By most accounts, the legislators reacted favorably to the new service.

Clearly, banking at home is a service that transcends geographic restrictions. Since no deposit-taking is involved in the Channel 2000 project, the bank sees no reason it cannot offer it to customers across state lines. Community Affairs officer Mike Van Buskirk points out that one of Banc One's affiliates in Portsmouth, Ohio has 20% of its customers in Kentucky. "I don't see why we can't use Channel 2000 there," he says.

And what of the competitive impact on the country's small banks? Home banking is "one more demonstration of a technology-driven service that forces banks to consolidate their resources," comments Fisher. "Each small bank will find it necessary to provide this service eventually—on their own or in conjunction with others." Bottom line, that means merger with a larger bank, help from a correspondent, or an amalgamation of many financial institutions; like the TYME network in Wisconsin and others.

Therefore, in between planning for NOW accounts, watching the discount rate, converting to on-line teller terminals, and truncating checks, bankers better keep an eye on home banking. Welcome to the '80s. ☐

FOR TRS-80*

SUPERSCRIPT

By Richard Wilkes

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By Tom Stibolt

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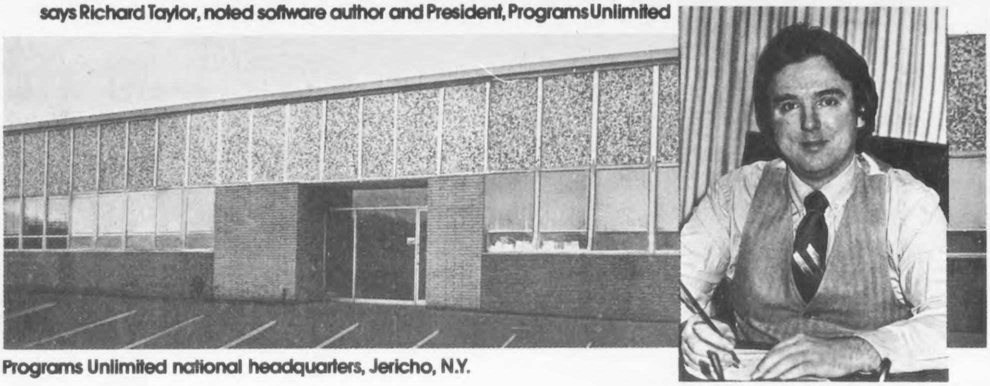

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MCCCCBBS

Terrence Ryan

On January 19, 1980, the Community Bulletin Board System of the Montgomery County Community College of Blue Bell, Pennsylvania, was put into service. This electronic bulletin board, representing the culmination of several months of effort, is intended to be a medium for correspondence between hobbyists in the microcomputing and related electronics fields. Any user with access to a telecomputing terminal may call in to the college and make use of the system. This individual is then free to communicate with the system, and may examine bulletins and messages left by others, or enter messages of his own, addressed to either a specific second party or to all users of the system. This system is truly a "community" bulletin board: no fees or charges are made, and no password or access code is required.

Hardware

The costs of implementing this system were kept to a minimum by making use of equipment already owned by the school. Specifically, an Apple II computer equipped with 48K of RAM and a minifloppy disk, owned by the Mathematics Department of the College, was used. This computer was available for use with the CBBS during evenings and weekends. To this computer it was necessary to add a modem (or MOdulator-DEModulator, a device which enables the computer to be used over the telephone lines), and a Real-Time Clock.

Software

The program was written primarily in Apple Integer Basic, with some 6502 machine language routines. Although writing the program exclusively in machine language would have offered an increase in execution speed, it was decided that a program written in Basic could be more easily serviced and expanded, especially by future students of the College. Surprisingly, through the use of efficient programming practices, this Basic-language program runs almost as fast as comparable machine language programs.

The CBBS is an active, dynamic project which will present a challenge and a continuing learning experience for students at the College for many years to come.

A primary consideration during the writing of this program was "system security." Since the system would be available to all, it was necessary to insure that no individual would be able to "crash" the system, or gain access greater than intended without specific consent of the system operator.* To this end, two major precautions were taken. First, a machine-language "interceptor" program was written which would block out illegal (control) characters, translate lower case characters into their upper case equivalents, and eliminate the chance of illegal length or value errors.

A second precaution included in the system is a software timer which limits the maximum permissible time for any response to 255 seconds. This is accomplished by making use of the one second interrupt pulse generated by the Mountain Hardware clock card. Each time a response is requested by the program, the following sequence of events occurs: control is passed from the Basic language program to the machine language input routine. This routine enables the interrupt pulse, sets a specific byte of memory to the value of 255 (Hex "FF"), and waits to receive a character from the modem. Then once a second, as an interrupt pulse is generated, control is passed from the input routine to a machine-language interrupt routine. This routine decrements the specified byte of memory, and examines this byte to see if 255 seconds have passed. If this is the case, the phone is hung up, and the entire CBBS program is reloaded from the disk. If 255 seconds have not elapsed, an RTI (return-from-interrupt) is performed, and the program returns to the input routine. This process continues until the user completes his response, at which time control is passed back from the input routine to the Basic program.

Extensions of Integer Basic

Two Basic functions not included in Apple Integer Basic, the VAL function and the ON ERROR command, were necessary for the program, and therefore routines had to be written to simulate these functions.

Our VAL subroutine, written by Rich Horsfall, examines a character string, and returns the numeric value of the string in a variable. If the string contained any invalid characters, a logical variable, ERR, is set equal to "TRUE" or 1. This provides a

---

Terrence Ryan, 135 East Third St., Apt. E, Lansdale, PA 19446.

*With special permission, students and faculty of the college have the ability to gain total access to the Apple computer through the CBBS, and can write their own programs on the Apple from their homes.

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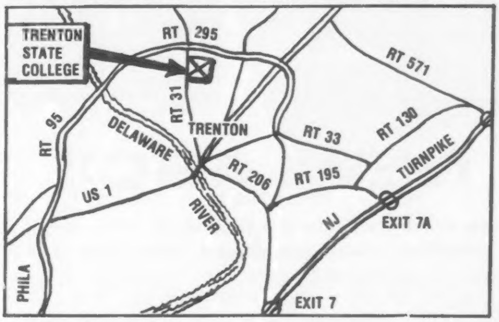
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convenient check of numeric entries to the program, and helps prevent the occurrence of an error condition. (Should such a condition occur, the program would be exited, and the user would have complete access to the system, a potential disaster!) The ON-DOS-ERROR routine, based on techniques described by Andy Herzfeld in *Micro Magazine,* causes any disk-associated error — disk full, I/O ERROR, etc. — to be fatal. It was felt that no disk error could be tolerated, and the program therefore hangs up and shuts down after such an error.

This system is truly a "community" bulletin board: no fees or charges are made, and no password or access code is required.

Accessing The CBBS

To insure that even first-time callers could use the system easily and efficiently the CBBS was written to be self-prompting. All responses are clearly explained, and the user is offered assistance at many points throughout the program. When a user logs on to the system, he is asked to give his name. This is used only for the signing of messages, and is not saved on disk as in other systems. The user is then given the option of viewing the system bulletins. "Bulletins" are items of general interest such as system hours, meetings of computer hobbyists' clubs, and new features of the system. (The viewing of these bulletins was made optional in an attempt to reduce the time an experienced user must spend on the system.)

The menu of permissible functions is then displayed, and the user is asked to specify which function he wishes to perform. These routines are as follows:

Quick Summary — Lists valid message numbers and their subjects.

Summary — Lists the above, as well as the date the message was entered, who it is intended for, and who it was written by.

Read A Message

New Message — For those who wish to leave a message on the system.

Full/Half Duplex — Toggles between these two modes.

Help — A quick description of the features of the system.

Bulletins — Reviews System Bulletins

Delete — Delete a message.

Time — Gives current date and time, as well as elapsed time (for budget-minded long distance callers).

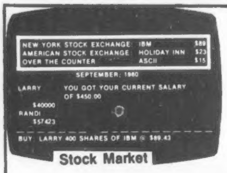
End — Terminate Session.

Future Goals

The second phase of the system, currently in the planning stage, will allow amateur radio operators with ASCII terminals — soon to be allowed by the FCC — to access the CBBS over the air. Hams with an interest in computers will then be able to communicate with computer hobbyists not involved in Amateur Radio. This would also give the radio operators access to other technical services provided by the school, such as satellite tracking and monitoring.

Another future application of the CBBS will be controlling equipment at the school (such as radios, apparatus for experiments, or computers) from long distances, or during evenings or weekends when the school is not open.

The response to the system so far has been overwhelming. In only a few weeks of operation, hundreds of callers have used the CBBS, leaving messages ranging from "articles for sale" to the formation of special interest groups. Many users have left suggestions for improvements to the system, most of which have been implemented as quickly as possible. It can be seen that the CBBS is certainly not a "static" facility, but rather an active, dynamic project which will present a challenge and a continuing learning experience for students at the College for many years to come. □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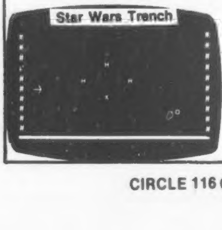
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In 1976, Creative published *The Best of Creative Computing, Volume 1*. I proposed to Virginia Londoner, publisher of *Byte*, that we also publish articles from *Byte* in book form. She agreed, and so we published *The Best of Byte, Volume 1*. It's a huge book of 386 pages with articles on hardware, software, technical tutorials, how-to materials and even some philosophy.

Although some of the technical material in *The Best of Byte* is out of date today, it nevertheless provides a good historical framework for the personal computing field. Not at all out of date are most of the software articles and tutorials. Similar books of other publishers are selling for $20 and up, so at $11.95, this one is quite a bargain.

Big Hearted

About the same time we were preparing *The Best of Byte* for publication, Nat Wadsworth of Scelbi approached Byte about doing a similar book. Virginia wanted to be nice to everyone, so she gave permission. Thus was born the *Scelbi-Byte Primer*.

Unfortunately, about half of the content of the two books was identical. Thus *Byte* was faced with a dilemma of which book to endorse and sell through their magazine. Inexplicably, they chose the Scelbi book. Thus we were left with twelve skids of *The Best of Byte*.

Hidden Away

In the next three years we sold a lot of these books. In fact, after we ran a special in 1979, we thought we had sold out.

However, we just moved to new quarters. In the move we found, lurking away in the back of our old garage, four skids of *The Best of Byte*. After some fitting words, the boss said "for 2¢, I'd give them away." So that's what we're doing.

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The original price of *The Best of Byte* was $11.95. If you order $11.95 worth of any of our other books or records, we'll throw in *The Best of Byte* for 2¢.

Thus you could order *The Best of Creative Computing, Vol. 3* ($8.95) and *Computer Coin Games* ($3.95). The toal price is $12.90. For $12.92 you also get *The Best of Byte*. Shipping and handling on all book orders is $2.00.

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CONFER Connection

Karl L. Zinn

Users of the Michigan Terminal System (MTS) based at the University of Michigan have easy access to an electronic bulletin board which goes well beyond the capabilities of the typical micro-based community bulletin board system (CBBS). For three years users of microcomputers have been sharing information about new products, software, and trends, and sometimes solving problems or scheduling meetings. Using microcomputers as terminals on the timesharing system also allows transferring files, downloading programs, and similar activites.

Origins of CONFER

The first version of CONFER was put together in the spring of 1975 to experiment with computer-based conferencing at the University of Michigan. One motivation was research on university governance, for example, to assist communication among members of a faculty committee and with their constituents. The program was also used to explore information systems in teaching and learning, including the communication, organization and reporting of information in seminars, group projects, and curriculum planning.

CONFER was programmed in Fortran by Robert Parnes, and draws heavily on the system subroutines of MTS (the host operating system) in a way which reduces the cost and raises the reliability of operation. CONFER is available to users whenever MTS is, usually 24 hours a day, seven days a week. (MTS has a few hours of scheduled hardware maintenance, and runs in "unattended mode" during late night hours on weekends; after midnight Saturday and Sunday, no operator is present to restart the system if something goes wrong.)

The software has continued to evolve over six years, and now offers excellent services for a variety of users. Within the University, CONFER is used by faculty committees, attendees at project staff meetings, and service groups as well as participants in seminars, courses, and other student groups.

Availability and Costs

CONFER provides an electronic bulletin board, messages, reminders, notices, and personal notes. It is easy to learn and economical to use. The cost of MTS is less than $2 per hour, including all processing and storage charges. Communication from outside the local Ann Arbor area costs nothing additional for users calling from Detroit, Lansing or Kalamazoo. The MERIT Computer Network connects the academic computing facilities of the four largest universities in the state, and the communications computer for the Network at each site costs about the same as the front-end computer on each of the hosts. From other major cities in the state or nation, communications costs are about $6 per hour (via Telenet). The cost is expected to drop with more favorable Telenet rates obtained through the participation of MERIT in a network serving higher education in North America (Edunet). The typical user of the microcomputer "conference" averages under one hour per week: under $100 per year.

Present users of this "electronic bulletin board" on microcomputers in education include researchers, professors, administrators, college students, high school students, teachers, service staff, vendors and publishers. All seem to enjoy the "democracy" of this electronic communication: it is not dominated by professors; students and staff also have the opportunity to be heard. (Often they are the ones who solve my problems with various microcomputers and software packages!)

Electronic communications are qualitatively different in this setting. The factors include:

- rapid communication,
- serendipity of useful information from unexpected sources,
- efficient communications involving busy experts,
- storage of useful information otherwise lost,
- organization through written expression and revision, and
- extension of face-to-face meetings (followup, second opinion).

Availability to Others

The University of Michigan limits computer access to faculty, staff, students and outside projects working with the University on research and instruction programs. In the last category I can include advisors on my research projects and consultants, but I still can't include everyone I would like to see using our microcomputer "bulletin board." There are many other groups that would like to use CONFER. However the University can't increase access when it can hardly expand its Amdahl 470/V8 fast enough to keep up with on-campus demands.

Happily, CONFER is now available to others through the Wayne State University Computer Systems Center. Anyone can purchase time on the system. Bob Parnes will set up new conferences for special groups of users. Use by Wayne State groups is increasing rapidly, and special services are offered to schools and other educational groups in the Detroit area.

Current Uses

Users are sharing information, posting notices (meetings, workshops, job opportunities, used equipment), coordinating purchases (disks, software, peripherals), and consulting with educational users of microcomputers. The list of categories ("agenda") in Figure 1 gives some idea of the content. However, one cannot appreciate the dynamics without actually participating. The sample session reproduced in Figure 2 just doesn't convey the impact on one's work.

In addition to my regular consultation with University faculty members through computer-aided communications, I have in the last month collected information for two articles, scheduled half a dozen meetings, reviewed parts of reports for a development project, gained expert advice on some communication problems,

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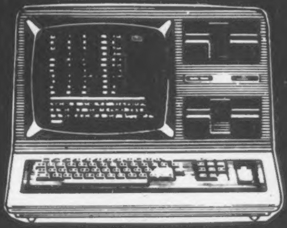
Karl Zinn, University of Michigan, Center for Research on Learning and Teaching, 109 E. Madison St., Ann Arbor, MI 48104.



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CONFER, continued...

learned of new software, communicated with staff while traveling, been reminded (by my "tickler file") to post notices for meetings and job openings as they become timely, heard first impressions of new products such as the Radio Shack Color Computer, NEC 8001, and the Commodore VIC, and so on.

Small, personal computers are great, but communicating with other users makes them even nicer.

Small, personal computers are great, but communicating with other users makes them even nicer. Large computer systems have a role. The Source and Micronet have made a nice start with commercial services, but for a look at some really nice communication aids, try CONFER on MTS some time. ☐

```
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data collection and real time analysis
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publications of special interest to educators
video used with micros (disc, tape, ...)
S-100 bus, peripherals, ...
CP/M and other operating systems
funding (planning, proposals, sources, ...)
applications (sources, review, evaluation, ...)
software selection (criteria, review, sources)
hardware selection (criteria, guidelines, advice)
cross assemblers and such on large systems
AMTS (Apple to MTS communications)
AMIE (Apple to MTS information exchange)
cluster support (disk, printer, plotter, communications)
formats, standards, translations, ...
Z80/Z8000 characteristics and systems
TI (Texas Instruments) 99/4, ...
Apple programs, applications
Apple characteristics, peripherals, prices
Atari 800, 400
Compucolor, Intercolor, ...
Exidy Sorcerer
Interact home computers (not producing)
Mattel home computers
Monroe educational computer
DEC (Digital Equipment Corp)
OSI (Ohio Scientific, Inc.)
PET/CBM/VIC (Commodore)
Radio Shack (Tandy) TRS-80, ...
Zenith Data Systems (Heath)
music and arts applications
word processing, text handling, data entry
information retrieval and management
statistical packages on micros (for education)
graphics and animation for education with micros
CBBS (community bulletin board systems)
communications with central systems and among micros
langages for education (Basic, Logo, Smalltalk, ...)
Pascal language, system, applications
used equipment for sale
job notices, opportunities, availability
people (activities, background, interests, ...)
projects, offices, service programs
clubs, special interest groups, associations
news items (stores, sales, ...)
workshops, institutes, seminars on micros in ed
meetings of micro users in education (SE Michigan)
conferences with implications for micros in ed
procedures, agenda, membership of this conference
retired and updated items
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Figure 1.

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I-8080 S-100 ENCLOSURE Sheet Metal Kit	Just like THE ORIGINAL IMSAI: Mainframe with blue cover, cardguides and hardware spaced for PS-28D Power Supply, up to 22 slot motherboard. *Kit of all metal parts and hardware with documentation* . . . . **$115.00** *Thinker Toys WunderBuss 20 for above w/o conn.* . . . . **$ 79.00** *AMP S-100 Connectors—each* . . . **$ 3.50** *8015 Blank jump-start panel w/3 switches* . . . . **$ 32.50** *8035 Jump start panel for 2 SA-400* **$ 78.50**
PS-28D Power Supply Parts Kit:	Mounts in the I-8080 enclosure, supplies +8V @ 28A, +/− 16V @ 3A, kit includes board, transformer, documentation, and all components. Improved from original. *Kit* . . . . **$ 95.50**
PIO 4-4	4 parallel inputs and outputs (8212) . . . **$160.00**
SIO 2-2	2 serial I/O ports, good to 19,200 baud . **$175.00**
DIO-C/D	2 board disk controller for 8" or 5¼" . . **$350.00**
CPM® 2.2	For DIO including documentation **$175.00**
CPA	Improved Imsai style front panel works with Z80, etc. **$225.00**
MPU-A	8080 processor board—requires CPA . **$100.00**
MPU-B	8085 3MHz processor SBC w/serial plus parallel port, monitor **$250.00**
RAM III 64K MEMORY	64K byte dynamic RAM board—Utilizes the Intel 3242 refresh controller and a single delay line for totally internal refresh. Uses time proven 4116 RAMS. Memory mapped I/O boards are allowed to coexist by the use of A16 buss pin 16. *Assembled & Tested* . . . . **$350.00** *Bare Board w/docs* . . . . **$ 40.00**
IKB-1	Intelligent keyboard uses 8035 . . . . . . **$149.50**
MDX	Dual SA400 drive enclosure . . . . **$ 75.00**
DE 8	Dual 800R/801R horizontal style enclosure w/power supply and fan . . . . **$240.00** *Case Only* **$100.00**

COMPLETE SYSTEMS

I-8080 SYSTEM	The basic 8080 based S-100 system. Includes CPA front panel, 22 slsot motherboard (with all 22 connectors), MPU-A 8080 CPU board, PS-28D power supply (+8V @ 28A, +/− 16V @ 3A), and chassis. COMPLETELY ASSEMBLED & TESTED. *With MPU-A* . . . . **$650.00** *Without MPU-A* . . . . **$600.00** *Thinker Toys 10MHz WunderBuss add* . . . . **$ 75.00**
I-8015 Complete System w/MPU-B	The complete 8085 system, includes MPU-B, RAM III, 10 slot terminated motherboard, PS-28D, and jump start front panel. A complete 64K system! *Assembled & Tested* **$1250.00**
I-8035	The complete 8085 system w/2 each TANDON TM-100, DIO-D, MPU-B, RAM III, chassis, 10 slot motherboard and power supply. Includes CPM® 2.2. *Assembled & Tested* **$2295.00**
VDP-40	Desk-top 8085 micro-computer system with keyboard, 9" CRT display, 10 slot S-100 board, disk controller, 64K dynamic RAM, 2 each TANDON 5¼" disk drives, 28 amp power supply. *Assembled & Tested* **$2895.00**
DS-8	Dual 801R horizontal style 8" disk enclosure w/power supply, fan, and 2 Shugart 801R drives. *Assembled & Tested* . . . . **$1100.00** *Above w/DIO-C & CPM 2.2* **$1500.00**

Ask about documentation, repair service, firmware and software for your system.

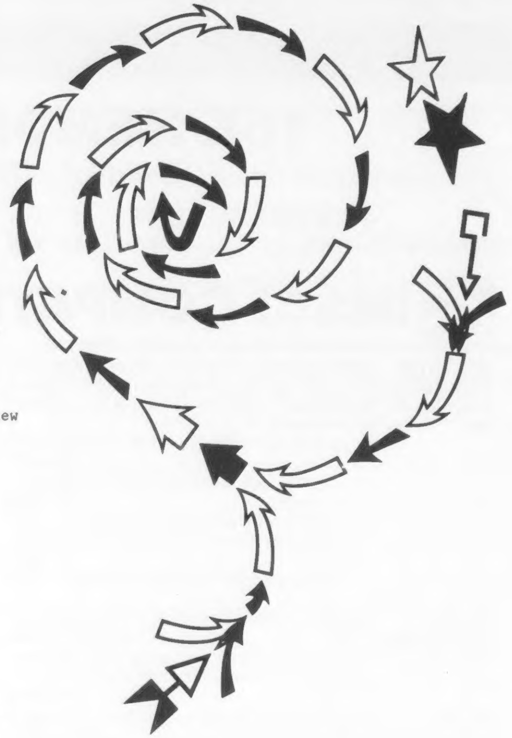
component supply, inc.

1771 Junction Avenue
San Jose, California 95112
(408) 295-7171

TERMS: (1) PREPAID Send check or M.O. for merchandise amount only - we pay the shipping within U.S. only.
(2) UPS COD or Bankcard orders by phone or mail - shipping charges added.
California Residents add 6.5% Sales Tax.

CIRCLE 269 ON READER SERVICE CARD

Figure 2.



```
 source crlt:micros

  CONFER II (10/80) - designed by Robert Parnes

 CONFERence for CRLT:MICROS  (organizer: Karl Zinn, 763-4410)
 Please respect the informal nature of some items.

 Reminder for Jan31/81
 List revision to send to Creative today!
 POSTPONE, DELETE, OR IGNORE?  delete
 Deleted

 No new messages
 DO NEXT?  transmit
 ENTER YOUR MESSAGE. TERMINATE WITH $ENDFILE
>Bernie, I am listing revised copy to send to Creative.
>I will get revised progress report as well as guide to you tomomrow.
>Karl
>\
 EDIT MESSAGE?
 ENTER RECIPIENT:  banet
 OK? TO SEND TO BANET, BERNARD (BERNIE) :  ok re copy for you to review
 CONFIRMATION WANTED?
 Message sent
 ENTER ANOTHER RECIPIENT (or press RETURN):

 DO NEXT?  agenda amie
 AMIE (APPLE TO MTS INFORMATION EXCHANGE)
 Items in this category
   78  102  117  121  125  133  204  231
 CATEGORIZE WHICH ITEMS?
 * THESE ITEMS?  yes
 These are now the * items.

 DO NEXT?  descriptor * last

 Item 231    17:08 Jan14/81    22 lines    Prime=204
 Doug Orr
 A version of AMIE which works with DC Hayes Micromodem is available

 DO NEXT?  d * previous

 Item 204    08:59 Dec17/80  152 lines    Prime=78
 Doug Orr
 Yet another new version of AMIE for Apple users everywhere.
 DO NEXT?  which *  "ontel"
   78  102  117  121
 * THESE ITEMS?  yes
 These are now the * items.

 DO NEXT?  descriptor * last

 Item 121    18:16 Oct04/80   110 lines    Prime=78
 Doug Orr
 Tiny Ontel is now AMIE (kind of like VISA)

 DO NEXT?  agenda meetings
 MEETINGS OF MICRO USERS IN EDUCATION (SE MICHIGAN)
 Items in this category
   15   96  101  105  187  196  216  237  251
 CATEGORIZE WHICH ITEMS?
 * THESE ITEMS?  yes
 These are now the * items.

 DO NEXT?  which * "Braun"
   237  251
 * THESE ITEMS?

 DO NEXT?  d 251

 Item 251    22:15 Jan29/81    36 lines
 Karl Zinn
 tentative schedule for visit of Lud Braun (and review of UM

 Doug Orr
 Yet another new version of AMIE for Apple users everywhere.

 DO NEXT?  which *  "ontel"
   78  102  117  121
 * THESE ITEMS?  yes
 These are now the * items.
 DO NEXT?  descriptor * last
```

```
 Item 121    18:16 Oct04/80   110 lines    Prime=78
 Doug Orr
 Tiny Ontel is now AMIE (kind of like VISA)

 DO NEXT?  agenda meetings
 MEETINGS OF MICRO USERS IN EDUCATION (SE MICHIGAN)
 Items in this category
   15   96  101  105  187  196  216  237  251
 CATEGORIZE WHICH ITEMS?
 * THESE ITEMS?  yes
 These are now the * items.

 DO NEXT?  which * "Braun"
   237  251
 * THESE ITEMS?

 DO NEXT?  d 251

 Item 251    22:15 Jan29/81    36 lines
 Karl Zinn
 tentative schedule for visit of Lud Braun (and review of UM
  instructional computing)

 DO NEXT?  item this nodescriptor
   Lud Braun (Engineering, SUNY at Stony Brook) will be visiting U of M
 Tuesday Feb 3 to see how we use computers in college teaching and
 learning.  In particular, I hope he will see the mix !
 GO BACK TO DO NEXT? yes

  DO NEXT?  reminder
  ENTER REMINDER NOTE. TERMINATE WITH $ENDFILE
>retrieve relevant items for Lud
>\
 EDIT REMINDER?
 EFFECTIVE DATE? (EG. 02-28-81):  +1
 Reminder posted for 02/01/81

 DO NEXT?  stop
You are leaving CRLT:MICROS.  Use  SIGNOFF  to leave computer.
#
```

New Data Factory compatible business program.

THE INVOICE FACTORY

NEW FOR THE APPLE

Do more than invoices

It isn't just an invoice program. The Invoice Factory generates an aged receivable report, a product or customer report, even a yearly bar graph analysis, and much more. You can calculate your yearly, semi-annual, and quarterly business in minutes.

...it's easy

And it's easy to operate. After only a few minutes with the Manual, anyone can enter orders and generate invoices. Your statements are ready automatically with 30, 60, or 90 day analyses. With The Invoice Factory your accounts will stay current and you will know exactly where the money isn't.

...it's ready when you are

We needed this system too! Our bills were going out later and later every month. With today's economy, and money tight, no one can afford to forget those receivables. As billing became more complex with service and handling charges, we found that we had to have a system to relieve our weary office staff. We had computers that didn't ask for raises or vacations, and didn't get the flu, or come in late; we therefore created another 'system that works.' We developed it to work in conjunction with The Data Factory, our data base management system, but it can also stand alone.

...it's automatic

The data disks that are generated by The Invoice Factory are fully compatible with The Data and Mini Factory. You just enter an account number and The Invoice Factory goes to work. It retrieves all the account information instantly. Terms of payment, method of shipping, special handling procedures, and even your own seasonal comments are noted. About three hundred accounts can be handled on one data disk. One hundred different products can be listed then tabulated automatically. UPS zones and fees are entered to compute charges quickly and correctly. Taxes can be added if desired. You have to see it operate to appreciate the speed and efficiency of the system.

...it's an investment

With this system, like our others, you can be sure that Micro Lab will add new features to make it even more powerful. By purchasing The Invoice Factory now, you will be able to have your input count. And the next version of the product will include many of the routines that perhaps you, yourself have suggested.

...it's always there

Again, we offer two identical program disks with each package. You are never without a back up should anything go wrong with the original copy. If you have an Extended Warranty just send the blown disk back to us for a renewal at no additional cost. And when new versions of the system are released, your extended warranty covers that as well. The annual Extended Warranty rate is $20. Without the Extended Warranty there is a $10 per disk fee for renewals. You will always have the current version of The Invoice Factory. When we add new features to the program your investment will become more valuable.

...it's available now

Micro Lab has a reputation for quality products. The Invoice Factory is a sure winner. Those that have seen it have been truly impressed with the simplicity yet power of the system. The Invoice Factory is offered at the introductory price of $100.00. It requires a 48k Apple II computer with Applesoft and two disk drives. Orders must be arranged through your local dealer.

micro lab

systems that work

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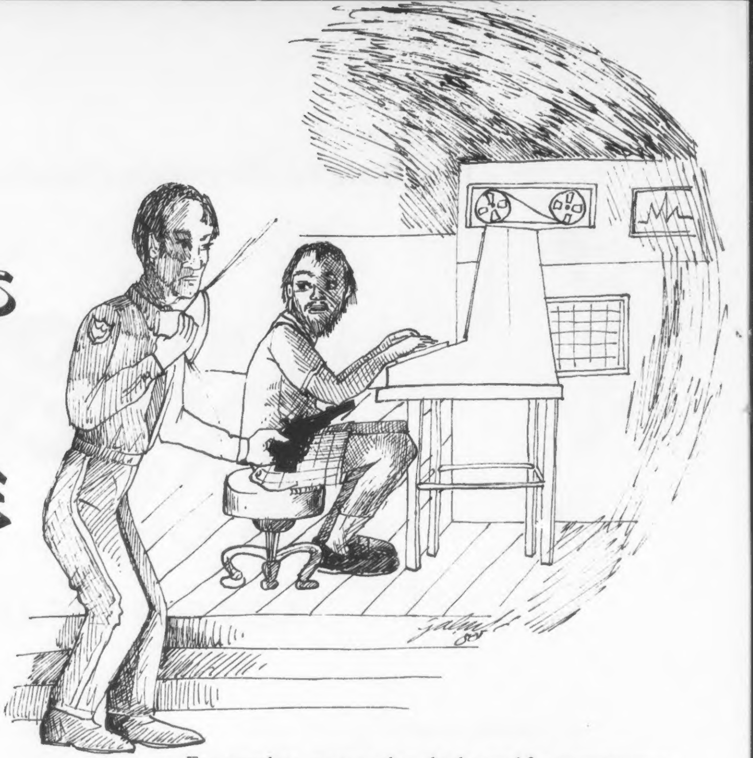
CIRCLE 155 ON READER SERVICE CARD

Obituaries from FACTONE



Wayne L. Slingluff

Friday, April 10, 1992

Memoriam Statements are presented to citizens this day as per Obligation (87) of Public Trust.

FACTONE does not agree with all comments (nor with any of those of criminal elements) herein faxed.

As conformed to the Detention Act of 1985, Section II, Paragraph 9, amended 1989, Memoriam Statements for those convicted in The Commonwealth are hereby devoxed, not more than 63% condensed from original.

Shallon, William 1947-1992

Look, you won't believe this, okay. It's too late for you, I know. The "crime" of which I am convicted is a poof, a confection of an apartment neighbor covetous of our hot water, and the fabrications of our recently "elected" IRS officialdom.

Yes, I was once a computer programmer. Hey! There was a time not long ago when it was not only honorable, but even legally profitably to write for computers. Okay, that was before the O.L.T., before the BHA plague, before Leaded Lungs. Before IRII took most of our jobs. I didn't do any of that, well, not directly. I was just working. Programming was an art/science as necessary as, say, spitzpelling today. And it was difficult — like modern romances of doctors in medicine before OMNICURE. We didn't have ENG IV, SPEAKEASY 90, or even WOWBASIC-86. We wrote our own s---------, l----, . . . (deleted-ed) . . ., yes, the stuff that some of you call obscene.

Oh, we knew about the coming second Industrial Revolution, all right. How could we predict its savagery, or the consequences to ourselves of Our Little Turndown. Never even nightmared of being driven from cities, ostracized, murdered by ModLuds. We really didn't think it would be called our fault.

Crime? We read about computer crime, but no more committed it than most two-handed subway riders are pickpockets. Crime has been a constant problem of any civilization; civilization has always dealt with it. I was a working stiff. I never stole a dime in my life. I didn't plan how to take away jobs.

For ourselves, we even thought the need for programmers might, someday, decrease. I didn't know we would have to get ProgCards. I didn't know how few there would be. I didn't know the connections that would be necessary to get them. How could I, in 1980?

So, of course, with no Card, and my background, I am unemployable. The maxim is "Hire No Progs." Everyone must use a computer. The few who might understand too much are as cursed as those seeing in the land of the blind. Employers fear us — insurance companies forbid us.

Surely, there was an honest profession not needing computers. Surely I could almost forget what I knew.

I wanted to work! Surely, there was an honest profession not needing computers. Surely I could almost forget what I knew. Surely someone would take a chance . . .

Yes, I once worked for a multinational. Hell, many of us did, back then. Okay, I even owned a home computer. That wasn't illegal, before the NYSCAM of 1984. I used it for games, not profit.

Anyway, Kathy was in poor health, unemployable because of my background, unable to even visit her parents. My two children were being forced into "TradeScouts 93." I was drafted — "A Burden On the City" — for the infamous HAYMKTSUPLR camp in the Berkshires.

What I then did was only . . . (condensed as per Public Law CS742SE, MA. -ed) . . . As you see, I am innocent of any wrongdoing.

Convicted of first degree computer fraud, known one-time employee of a notorious Multi, mr. SHALLON 181-40-8821CR was P.Q.N. this National Emergy under Section 6, bled to the death at Amherst, the earthly remains left to our common good at a Hopewell Farm for the Destitute. He is survived by a wife and two children, under custody of The Commonwealth. ☐

Wayne L. Slingluff, 71 Phillips St., Boston, MA 02114.

A major breakthrough in the learning process.

the learning system.

BY
SCOT KAMINS, PHD

People have been coming up with new ways to teach things to one another since the beginning of time. Various breakthroughs have occurred and we have progressed. We offer another breakthrough—"The Learning System" by Dr. Scot Kamins. This combination of programs is a truly interactive teaching vehicle that can positively teach any subject to anyone. The instructor has a teaching and testing tool and the user learns and expands his knowledge of the subject while receiving positive interaction with the computer.

This system is important. It is meaningful because it allows any company, no matter how small, to prepare a training device for its employees. No one need take time off his job for instructing a new person. Additional tutoring or refinements to a routine can be taught and tested quickly. The educator can creatively teach his subject in an effective way to give the learner that "something extra." If you use the validity analysis data, that the system produces, you can key in to the areas that must be retaught. Effective, quick analysis of test results allows the instructor to operate more effectively.

Let's face it, teaching today, whether in the school system or in the business environment is a tough assignment. Because of the fluent society, more and more people must learn quickly. If you could use "The Learning System" to teach people faster and more effectively, this will save you time and money.

Set Up

Set up your own text with instructions or information. Then key it to a test to check for learning comprehension. Use an instruction or a test mode. The instruction mode will give hints and help to the user, while the exam mode tests and stores score results. Choose a multiple choice, fill-in, or column matching format. Write your questions and answers to correspond to portions of the composition so that in the instruction mode, a review of that section will occur. Or, set up a quiz independently without reference to the text on the computer.

Using the instruction mode, The Learning System becomes a tutorial program. The user has two or three chances to answer each question. Thereafter, he is told the answer and must rewrite it correctly. At the conclusion of each series of questions, the user must retake those questions that were answered incorrectly. Ample help is available if he has forgotten the correct answer. There are multiple levels of reinforcement.

In the test mode, there are no second chances! One answer only is entered by the user. The testee is given the number and percentage of correct responses and the number of times to get it. At the conclusion of the exam the learner can receive the score immediately. However, this score is retained on a records disk along with a name for later analysis by the instructor.

Scoring

Test results may be evaluated on many levels: for analysis of the user's strengths or weaknesses; comparison to others who have taken the same exam; as a device for the instructor to see how well he has taught the material; or to evaluate the validity of the questions used. Scores from other exams may be viewed, compared, averaged, or printed out if you have a printer.

Comparing the results of many exams from an entire class, the instructor can see what must be retaught. He can check the percentage of users that answered each question correctly or incorrectly to establish whether it was a fair one. The class curve can easily be computed. Grades can be given at marking time without spending days computing and averaging exam scores.

Apple Compatible

The Learning System is presently being offered for the Apple computer but will be available in other versions. You will need 48k, Applesoft in ROM. The system will operate using either one or two disk drives. Future versions will be available for home use and special applications.

Backup Protection

The Micro Lab Extended Warranty is again an option. Should any disk need renewing, it will be handled free of charge to all policy holders. The annual Extended Warranty is priced at $30. Updates offering additional features will be made and user feedback is always solicited. When new versions are released, your Extended Warranty covers them as well. Without this policy, there is a $10 per disk fee for renewals.

A Complete System

The system is sold as a package with one master disk plus two player disks. You supply the test and record disks as you need them. You will also receive a backup of the master disk. Extra player disks can be purchased. An easy to understand manual explaining all features is provided.

See our demo at your local Apple dealer. The Learning System is priced at an introductory offer of $150.

micro lab
learning center
systems that work

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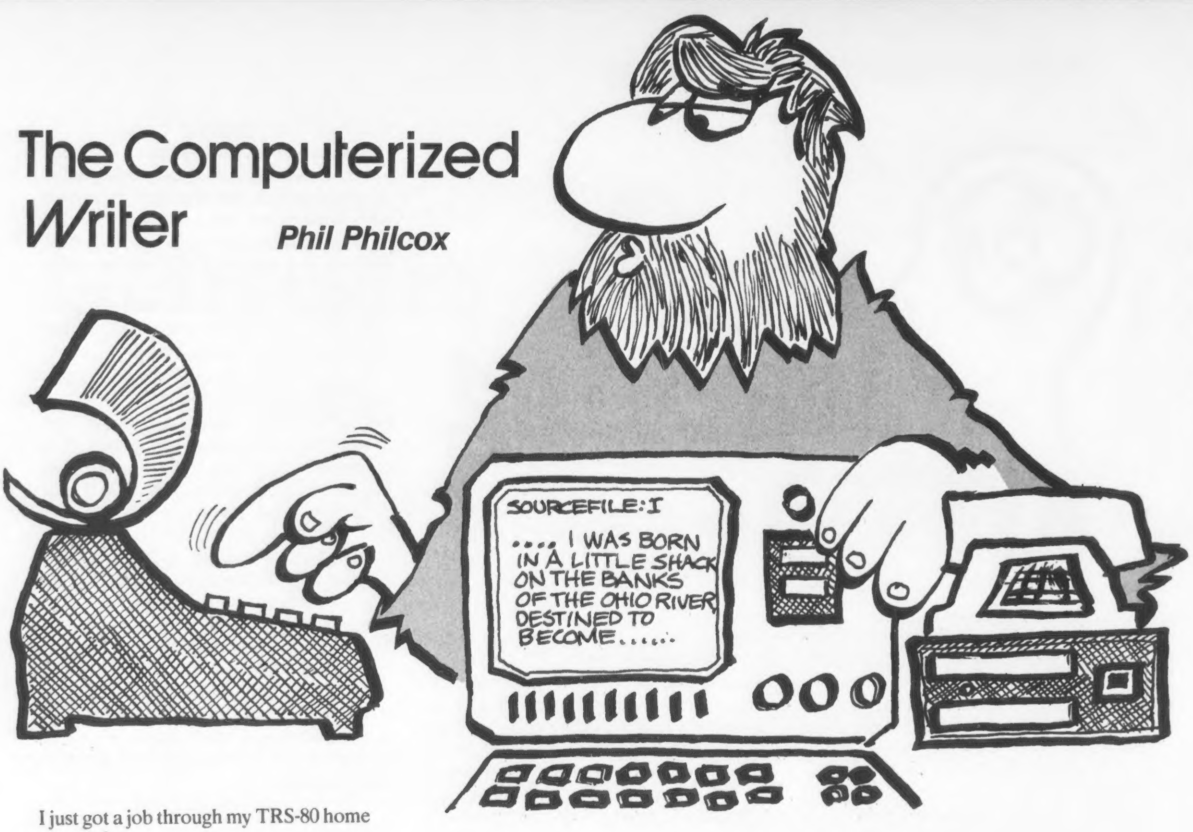
CIRCLE 156 ON READER SERVICE CARD

The Computerized Writer

Phil Philcox


SOURCEFILE:I
....I WAS BORN IN A LITTLE SHACK ON THE BANKS OF THE OHIO RIVER DESTINED TO BECOME......

I just got a job through my TRS-80 home computer!

I'm a full-time freelance writer living in Florida and if you've ever been a full-time freelance writer (living anywhere) you know what kind of a life I lead. All in all, it's been a lousy week. Yesterday I got three rejections, a "go-ahead-on-speculation" from a retirement magazine in California, a "definitely-not-interested-but-thanks-anyway" from *Playboy*, a check for $20 from *Writers Digest* and another check for $150 from a magazine that pays on publication and published my article in the Easter 1978 edition of their magazine. I guess you can understand then that anything we writers can get for our carefully-chosen words is ok with us. If you don't understand, multiply what you think it's like to be a full-time freelance writer by "237-negatives" and you'll be close.

To make a long computer story short, I never mastered the complex computer language, but I did learn to stuff expensive, pre-programmed tapes into the TRS-80's innards and wasted a lot of time balancing my meager checkbook and playing animated versions of Chinese checkers.

Somewhere between the excitement of getting a new toy and the frustration of trying to communicate with it, I sold a few home computer articles to minor magazines for $50-$100 which managed to support my pre-programmed tape habit.

Like overweight wives and husbands who are always late for dinner, the thrill was soon gone. It was strictly an owner-machine relationship and if you can't talk to each other, you just sit there like a dummy or take another shot of pre-programmed mylar . . . sort of like trying to order a hamburger and fries in a genuine Chinese restaurant staffed by genuine Chinese waiters just off the box from Shanghai.

In my search for article material, I probably write about 25 letters a week looking for input and somehow, one of my input letters landed on the desk of Noel Tyl, director of communications for the Source Telecomputer Corporation in McLean, VA. The Source is the latest move into the 21st century and a big step toward what could be a major breakthrough in the field of mass communications.

You can access the Source through a telephone modem and any home computer becomes an instant information, education and entertainment center. You can forget complex computer statements and communicate with commands like CHAT, HELLO, HOW ARE YOU? and QUIT. If you get stuck, just type FUTILE and the Source will lead you out by the hand.

To access the Source, you pay a one-time hookup fee of $100, then $15 an hour for line time during prime time (8 a.m. to 6 p.m.), $4.25 an hour during non-prime time (6 p.m. to 12 p.m. weekdays all day weekends and all holidays—when you're most likely to be playing with your electronic toys) and only $2.75 an hour if you can stop wiggling in your seat until after 12 p.m. to go information-education hunting. That's about what I pay for a movie ticket and a box of unbuttered popcorn, so comparing the Source to an ordinary movie and minimal refreshments is like comparing "60 Minutes" to "The Laverne and Shirley Show"—there ain't no comparison.

I've yet to tap into the Source's vast information network, but I did discover the Computer Search International Career Network and the Bulletin Board and soon found others discovering me as a writer-for-hire. Through CSI's network, you can access the computerized files of job placement agencies around the country, (legally, of course), so if you're a scientist living in New Jersey and think the job market might be better in Wyoming (it isn't), you can call up this information on your computer screen and see for yourself. I found a job listing for a technical writer in Seattle, paying $55,000 a year plus expenses, but they listed eight must-haves and I didn't have any of them. Oh well, it's always raining in Seattle anyway and chances are they wouldn't let me work in my pajamas (like I am right now).

You can feed your resume into the network by contacting any of the member

---

Phil Philcox, Information Press Service, 5118 Rolling Hills Court, Tampa, FL 33617.

executive recruiting firms or through CSI headquarters and if you're a marketable commodity, you could get a call from some company president sitting in a genuine leather, $1500 swivel chair somewhere out there over the horizon. I threw some of my qualifications on the Source's Bulletin Board, then went back to playing Chinese Checkers with the computer. (He/she's won 161 games, lost none.)

Somewhere between November 15th and December 20th, 1980, I got some inquiries from my computer listing (they reach me through my electronic mailbox) but obviously not too many people were interested in a ghostwriter who was no longer a ghost—advertising can do that.

On the 21st of December, a day that might go down in freelance writing history as the first electronic freelance writing job ever consummated by computer, I turned on my TRS-80, checked my mailbox and there was a message waiting for me from TCAXXX (I can't give you his number, I'm a ghost, remember?) in Chicago, asking me for my Tampa telephone number (I'm TCA093). I answered his letter, typed EXPRESS MAIL .SEND and shut down the computer to free the phone lines. In ten minutes the phone rang.

"Can you," TCAXXX asked, "look at my book manuscript, help me get it organized, do some rewriting if necessary, keep your mouth shut and sell it to a publisher for a $10,000 advance and 25% royalty on each copy sold?"

"Yes, yes, yes, yes, no, no," I answered honestly.

TCAXXX is the president of a real estate company who had 123 pages of a proposed 250-page real estate book in various stages of completion (read that "mess"). I rattled off some credits and convinced him over the phone I knew the difference between a computer keyboard and a typewriter keyboard and yesterday I received a package containing 123 single-spaced, handwritten pages in the mail. Attached to the top page was a check for half of a job that will hopefully be well done. I figure it will take me about a month to complete the job—if I can stay away from my Chinese Checker games and the Source long enough to get some work done.

If you're a scientist living in New Jersey and think the job market might be better in Wyoming, you can call up this information on your computer screen and see for yourself.

I'm rich! I'm working! I'm computerized!!!

Update

For a ghostwriter, there has to be a link between the paying author and the getting-paid writer and using the Source, we've worked out the following system. The TRS-80 is linked to the Source through a Lynx Telephone Modem from Emtrol Systems, and my IBM Selectric has been transformed into an electronic secretary using Rochester Data's typewriter conversion kit.

By waiting until after 12 p.m. to feed manuscript copy into his file, then transmitting it to my file in Florida, TCAXXX pays only $2.75 an hour to put his manuscript rough on line. I LPRINT the incoming data after 12 p.m. EST, edit during the day directly on the typewriter, then feed the edited copy back to Chicago for his comments.

Using the Source's electronic mailbox, we can exchange ideas and incorporate them into the manuscript file. About once every two weeks, we make telephone contact for some comments, then turn back to the computers as the finished copy files elecronically between Tampa and Chicago. ☐

micro lab presents

Crown of

Arthain

By Dan and Marilyn Meller

HEAR YE! HEAR YE!

NEW FOR THE APPLE

Gather round ye Knights and Ladies. Behold! I tell ye of a new game written by Sir Dan and Lady Marilyn Meller. One encounters a challenging test of skill that only the bravest should attempt. The consequences are dire.

I know thou hast seen games played on wooden boards before. While this game has a board divided into hex shapes, it cannot be played on a table top! This one is played only on an Apple. It is a new game — of a type you have never before seen. Fierce monsters of types you have heard spoken of, but never dreamed you would look upon, appear lifelike before your very eyes.

In the Kingdom of Arthain, the good King lies dying. His sons, Princes Berthain and Merthain, previously banished, have been summoned. The one who successfully fords the stream, crossing through hexes of forests and lakes to find the proper passage to the underground mountain hall where the crown lays, could win the Kinghood. He must accumulate gold to buy the map to aid him on this dangerous journey. Monsters are lurking everywhere. But take heed and listen to my wise counsel. A new more powerful and dangerous creature guards the Crown. The prince who tries to get the crown must have much experience along with a high defense and attack factor. Magical aids he encounters along the way will help.

This one or two player high res color adventure can be played on twenty skill levels. While almost any knave can win the crown at the easier skill levels, only the most practiced nobleman can win at the highest levels. One must be a skillful and expert swordsman to win the Kinghood at Level 1. He must be prepared to thrust, hack, or shield his weapon at any moment or be mercilessly destroyed. Only the alert and clear-headed will succeed. Go with God.

Make haste if you wish to see this high res adventure game at your Apple dealer. One needs any Apple computer with 48K and Applesoft in ROM. The "Crown of Arthain" is priced at $35.

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systems that work
3218 Skokie Valley Road • Highland Park, IL 60035
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CIRCLE 152 ON READER SERVICE CARD

The Osborne 1

The Design

Lee Felsenstein has done it again. Once you get used to a word processing system, it is not easy to go back to the dark ages of writing with pencil and paper. But on an airplane, what choice do you have?

Now, it appears there is a choice. The Osborne 1 is a self-contained portable system that can run for three to five hours on an optional battery pack. Weighing just 20 pounds and measuring 18" x 13" x 8" it fits (barely) under an airline seat.

Felsenstein's design is based around a Z-80 MPU with 64K of memory (RAM) and a separate, partitioned ROM containing the operating system. A 5" CRT monitor is built-in although a 9" monitor is available as an optional extra. The monitor displays 24 lines of 50 characters. However, the display is actually a "window" on a longer 128-character line.

A dual floppy disk drive is built-in with packing of 100K per disk. A thoughtful touch is an included storage compartment for extra disks.

Two interfaces are provided: RS232C and IEEE 488 which should handle virtually every type of printer, plotter or external peripheral. A modem with acoustic coupler plugs into a special jack.

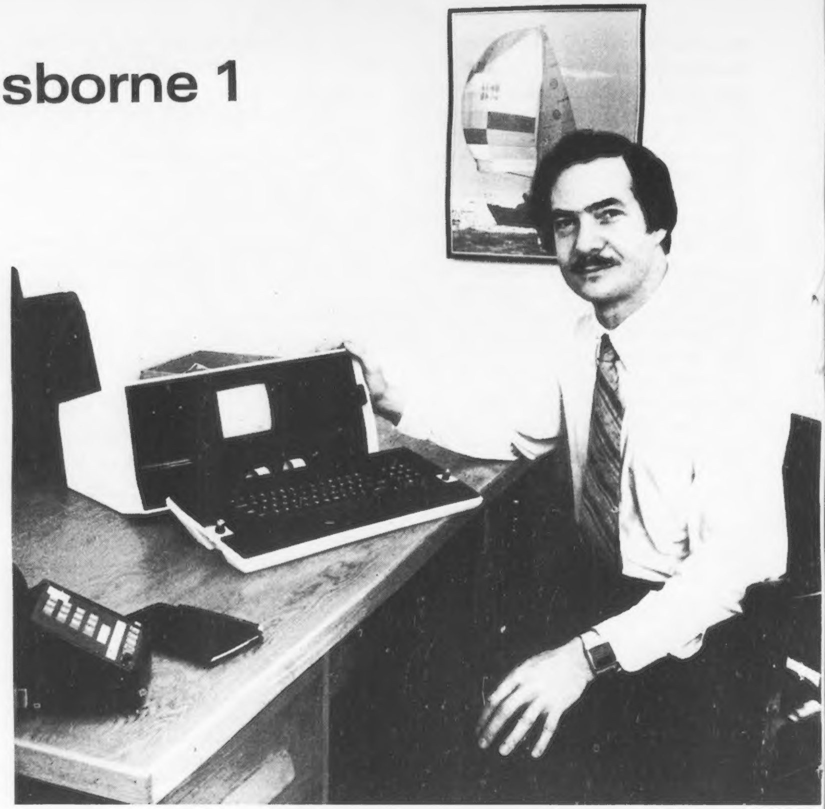
Hardware without software might as well be a boat anchor. Obviously Osborne doesn't want his systems used for boat anchors as standard software includes CP/M, CBasic, WordStar and MailMerge. There is also a package similar to VisiCalc.

Felsenstein has grown up in this field and knows it from manufacturer to retailer to customer. Nowhere has he demonstrated his concern for the customer better than in the concept of swap-out maintenance. Under normal circumstances, the customer can run a diagnostic, isolate a problem, pull the faulty board or module and swap it for a good one.

Options include the 9" monitor mentioned above, an acoustic coupler, and a battery pack good for three to five hours per charge.

The system is aimed, obviously, at the business professional, but our bet is that it will find a much wider market than that. Especially considering that the base price is $1595—at least $800 less than a similarly configured Apple not to mention the portability, CP/M software and expected high reliability.

For more information, write Osborne Computer Corp., 2650 Corporate Ave., Hayward, CA 94545 or check **273** on the Reader Service Card.



Adam Osborne poses with his latest venture, the Osborne 1.

Some Related History

Last Time Around With Lee Felsenstein

David H. Ahl

It was a particularly miserable night in November 1976. The rain which had started early that Friday morning was still coming down in sheets buffeted by a gusty wind. The temperature was hovering just above freezing causing a dense fog. Between the fog, rain and wind, driving was hazardous and slow.

Nevertheless, drive I did to meet Lee Felsenstein at Newark Airport. Lee was hopping around the country to each of the five major personal computing magazines, each of which were being given a Sol-20 computer for evaluation. *Creative* was the third stop, and what a stop it was!

After I met Lee at the passenger terminal, we drove (or should I say boated) to the air freight depot to pick up the Sol which had been previously shipped by Processor Technology. But, alas, no Sol was there.

Many phone calls later, Lee determined that the plane carrying the Sol had been diverted to Kennedy. The computer would arrive in Newark the next day by truck. That was fine with me. It was 10 p.m. and by the time we got back to Morristown in that weather it would be 11 p.m. plus.

But that was not okay with Lee. He was on a schedule and couldn't afford an extra day in New Jersey. So off we set for Kennedy. Hours later we found the correct air freight depot, convinced them that we were the rightful recipients of the shipment and set off for Morristown.

The rain had let up, but the fog persisted, making it a long trip home. Finally, at 2 a.m., out came the most compact and well-engineered computer I had ever seen. Compared to the Altair, Imsai and SWTPC kits we had recently assembled, here, indeed was a giant improvement. Keyboard, CPU, memory and five expansion slots all in one

DYNACOMP

Quality software for⁺:

ATARI
PET
APPLE II Plus
TRS-80 (Level II)*
NORTH STAR
CP/M 8" Disk

GAMES, SIMULATIONS, EDUCATION and MISCELLANEOUS

BRIDGE 2.0 (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
An all-inclusive version of this most popular of card games. This program both BIDS and PLAYS either contract or duplicate bridge. Depending on the contract, your computer opponents will either play the offense OR defense. If you bid too high, the computer will double your contract! BRIDGE 2.0 provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice.

HEARTS 1.5 (Available for all computers) **Price: $14.95 Cassette/$18.95 Diskette**
An exciting and entertaining computer version of this popular card game. Hearts is a trick-oriented game in which the purpose is not to take any hearts or the queen of spades. Play against two computer opponents who are armed with hard-to-beat playing strategies.

STUD POKER (ATARI only) **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic gambler's card game. The computer deals the cards one at a time and you (and the computer) bet on what you see. The computer does not cheat and *usually* bets the odds. However, it sometimes bluffs! Also included is a five card draw poker betting practice program. This package will run on a 16K ATARI. Color, graphics, sound.

POKER PARTY (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple Cassette and diskette versions require a 32 K (or larger) Apple II.

VALDEZ (Available for all computers) **Price: $14.95 Cassette/$18.95 Diskette**
A simulation of supertanker navigation in the Prince William Sound and Valdez Narrows. The program uses an extensive 256X256 element radar map and employs physical models of ship response and tidal patterns. Chart your own course through ship and iceberg traffic. Any standard terminal may be used for display.

FLIGHT SIMULATOR (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers.

CRIBBAGE 2.0 (TRS-80 only) **Price: $14.95 Cassette/$18.95 Diskette**
This is a well-designed and nicely executed two-handed version of the classic card game, cribbage. It is an excellent program for the cribbage player in search of a worthy opponent as well as the beginner wishing to learn the game, in particular the scoring and jargon. The standard cribbage score board is continually shown at the top of the display (utilizing the TRS-80's graphics capabilities), with the cards shown underneath. The computer automatically scores and also announces the points using the traditional phrases.

CHESS MASTER (North Star and TRS-80 only) **Price: $19.95 Cassette/$23.95 Diskette**
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users.

STARTREK 3.2 (Available for all computers) **Price: $ 9.95 Cassette/$13.95 Diskette**
This is the classic Startrek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without warning while also attacking starbases in other quadrants. The Klingons also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Enterprise is besieged by three heavy cruisers and a starbase S.O.S. is received! The Klingons get even!

SPACE TILT (Apple only) **Price: $10.95 Cassette/$14.95 Diskette**
Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound simple? Not when the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in this habit-forming action game.

GAMES PACK I (Available for all computers) **Price: $9.95 Cassette/$13.95 Diskette**
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu.

GAMES PACK II (Available for all computers) **Price: $9.95 Cassette/$13.95 Diskette**
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu.

Why pay $7.95 or more per program when you can buy a DYNACOMP collection for just $9.95?

NOMINOES JIGSAW (ATARI and TRS-80 only) **Price: $16.95 Cassette/$20.95 Diskette**
NOMINOES JIGSAW is an intriguing and sophisticated graphical puzzle. The jigsaw consists of a 9 by 9 board partially filled with randomly chosen shapes (nominoes), of which there are 60 types. By knowing that the shapes must be legally connected, and by guessing the shape at each location, all the nominoes may be eventually deduced. Scoring is based on the number of guesses required and the difficulty of the board set-up.

MOVING MAZE (Apple only) **Price: $10.95 Cassette/$14.95 Diskette**
MOVING MAZE employs the games paddles to direct a puck from one side of a maze to the other. However, the maze is dynamically (and randomly) built and is continually being modified. The objective is to cross the maze without touching (or being hit by) a wall. Scoring is by an elapsed time indicator, and three levels of play are provided.

BLACK HOLE (Apple only) **Price: $14.95 Cassette/$18.95 Diskette**
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe. Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

TEACHER'S PET I (Available for all computers) **Price: $ 9.95 Cassette/$13.95 Diskette**
This is the first of DYNACOMP's educational packages. Primarily intended for pre-school to grade 3, TEACHER'S PET provides the young student with counting practice, letter-word recognition and three levels of math skill exercises.

CRYSTALS (ATARI only) **Price: $ 9.95 Cassette/$13.95 Diskette**
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari.

CRANSTON MANOR ADVENTURE (North Star only) **Price: $19.95**
At last! A comprehensive Adventure game for the North Star. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette. Requires 32K.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY **Price $9.95 Diskette**
DYNACOMP now distributes the 20 + volume NSSE library. Most of these diskettes offer an outstanding value for the purchase price. Write for details regarding the contents of this library and quantity (four or more) purchases.

Availability

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM format) 8" CP/M floppy disks for systems running under MBASIC.

BUSINESS and UTILITIES

MAIL LIST II (Apple and North Star diskettes only) **Price: $24.95**
This many-featured program now includes full alphabetic and zip code sorting as well as file merging. Entries can be retrieved by user-defined code, client name or Zip Code. The printout format allows the use of standard size address labels. Each diskette can store more than 1100 entries (single density North Star or Apple DOS 3.2; over 2200 with double density North Star or Apple DOS 3.3)!

FORM LETTER SYSTEM (FLS) (Apple and North Star diskette only) **Price: $17.95**
FLS may be employed to generate individually addressed form letters. The user creates the address file and separately composes the letter. FLS will then print form letters using each address. FLS is completely compatible with MAIL LIST II, which may be used to manage your address files.

FLS and MAIL LIST II are available as a combined package for $37.95.

TEXT EDITOR I (Letter Writer) **Price: $14.95 Cassette/$18.95 Diskette**
An easy to use, line-oriented text editor which provides variable line widths and simple paragraph indexing. This text editor is ideally suited for composing letters and is quite capable of handling much larger jobs. Available for all computers.

PERSONAL FINANCE SYSTEM (ATARI only) **Price: $34.95 Diskette**
PFS is a single disk menu oriented system composed of 10 programs designed to organize and simplify your personal finances. Features include a 300 transaction capacity; fast access; 26 optional user codes; data retrieval by month, code or payee; optional printing of reports; checkbook balancing; bar graph plotting and more. Also provides on the diskette is ATARI DOS 2.

FINDIT (North Star only) **Price: $19.95**
This is a three-in-one program which maintains information accessible by keywords of three types: Personal (eg: last name), Commercial (eg: plumbers) and Reference (eg: magazine articles, record albums, etc). In addition to keyword searches, there are birthday, anniversary and appointment searches for the personal records and appointment searches for the commercial records. Reference records are accessed by a single keyword or by cross-referencing two or three keywords.

DFILE (North Star only) **Price: $19.95**
This handy program allows North Star users to maintain a specialized data base of all files and programs in the stack of disks which invariably accumulates. DFILE is easy to set up and use. It will organize your disks to provide efficient locating of the desired file or program.

COMPARE (North Star only) **Price: $12.95**
COMPARE is a single disk utility software package which compares two BASIC programs and displays the file sizes of the programs in bytes, the lengths in terms of the number of statement lines, and the line numbers at which various listed differences occur. COMPARE permits the user to examine versions of his software to verify which are the more current, and to clearly identify the changes made during development.

COMPRESS (North Star only) **Price: $12.95**
COMPRESS is a single-disk utility program which removes all unnecessary spaces and (optionally) REMark statements from North Star BASIC programs. The source file is processed one line at a time, thus permitting very large programs to be compressed using only a small amount of computer memory. File compressions of 20-50% are commonly achieved.

GRAFIX (TRS-80 only) **Price: $12.95 Cassette/$16.95 Diskette**
This unique program allows you to easily create graphics directly from the keyboard. You "draw" your figure using the program's extensive cursor controls. Once the figure is made, it is automatically appended to your BASIC program as a string variable. Draw a "happy face", call it H$ and then print it from your program using PRINT H$! This is a very easy way to create and save graphics.

TIDY (TRS-80 only) **Price: $10.95 Cassette/$14.95 Diskette**
TIDY is an assembly language program which allows you to renumber the lines in your BASIC programs. TIDY also removes unnecessary spaces and REMark statements. The result is a compacted BASIC program which uses much less memory space and executes significantly faster. Once loaded, TIDY remains in memory; you may load any number of BASIC programs without having to reload TIDY!

STATISTICS and ENGINEERING

DATA SMOOTHER (Not available for ATARI) **Price: $14.95 Cassette/$18.95 Diskette**
This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) **Price: $14.95 Cassette/$18.95 Diskette**
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) **Price: $19.95 Cassette/$23.95 Diskette**
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $44.95 (three cassettes) and $56.95 (three diskettes).

REGRESSION I (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data and curve plotting; a statistical analysis (eg: standard deviation, correlation coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data and results may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) **Price: $19.95 Cassette**
$23.95 Diskette
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $49.95 (three cassettes) or $61.95 (three diskettes).

BASIC SCIENTIFIC SUBROUTINES, Volume I (Not available for ATARI)
DYNACOMP is the exclusive distributor for the software keyed to the text *BASIC Scientific Subroutines, Volume I* by F. Ruckdeschel (see the BYTE/McGraw-Hill advertisement in BYTE magazine, January 1981). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Collection #1:	Chapters 2 and 3:	Data and function plotting, complex variables
Collection #2:	Chapter 4:	Matrix and vector operations
Collection #3:	Chapters 5 and 6:	Random number generators, series approximations

Price per collection: $14.95 Cassette/$18.95 Diskette

All three collections are available for $39.95 (three cassettes) and $49.95 (three diskettes).

Because the text is a vital part of the documentation, *BASIC Scientific Subroutines, Volume I* is available from DYNACOMP for $19.95 plus 75¢ postage and handling.

ROOTS (Available for all computers) **Price $9.95 Cassette/$13.95 Diskette**
In a nutshell, ROOTS simultaneously determines all the zeroes of a polynomial having real coefficients. There is no limit on the degree of the polynomial, and because the procedure is iterative, the accuracy is generally very good. No initial guesses are required as input, and the calculated roots are substituted back into the polynomial and the residuals displayed.

Ordering Information

All orders are processed and shipped postpaid within 48 hours. Please enclose payment with order along with computer information. If paying by VISA or Master Card, include all numbers on card. For orders outside North America add 10% for shipping and handling.

Add $2.50 to diskette price for 8" floppy disk (IBM format soft sectored, CP/M, Microsoft BASIC)

*TRS-80 diskettes are not supplied with DOS or BASIC.

Deduct 10% when ordering 3 or more programs.

Ask for **DYNACOMP** programs at your local software dealer. Write for detailed descriptions of these and other programs from **DYNACOMP**.

DYNACOMP, Inc.
1427 Monroe Avenue
Rochester, New York 14618
24 hour mail order phone: (716)586-7579
Office phone (9AM-5PM EST): (716)442-8960

New York State residents please add 7% NYS sales tax.

⁺ *ATARI, PET, APPLE II, TRS-80, NORTH STAR, CP/M and IBM are registered trade names and/or trademarks.*

CIRCLE 136 ON READER SERVICE CARD

Osborne, continued...

case plus a built-in operating system or, as Processor Technology called it, "personality module."

Lee had a bit of trouble getting it going because I didn't have a monitor and my Pixieverter RF modulator was powered by the 8V power supply in the Altair. By 3 a.m., we had kluged together a makeshift arrangement and were finally "on the air."

Over the years I've kept in touch with Lee and he's written an occasional piece for *Creative Computing*. About two years ago he told me about a "dream" computer he designed for Processor Technology to be the replacement for the Sol-20. Unfortunately a few months later PTCo closed their doors and Lee's computer never got into production.

Now, through the happy marriage of the management of Adam Osborne, the venture capital of Jack Melchor (Rolm Corp, etc.), and a completety new design from Lee, we have the Osborne 1.

We're looking forward to getting one for evaluation in an upcoming issue. But this time, I'm going to insist that it be delivered to Morristown!

Footnote: Our Sol-20 is one of the most reliable computers we have. It has been in constant use for four years. Hooked to a PTCo Helios floppy disk system and SelectraTerm, it is the principal word processing system used by Editor Betsy Staples and our retail sales department.

The Philosophy

Adam Osborne

According to Adam Osborne the success he projects for the Osborne 1 will be attributable to its unique design. Here we find some of the philosophy behind that design.

After examining the small computers currently available and the marketing strategies of the companies that make them, I came to the conclusion that what we do not need are close copies of existing products. We do not need more powerful and more expensive microcomputers. What we need is a major price breakthrough. We need a microcomputer with the capabilities of existing products, but with a much lower price tag. Such a machine, I decided, can be built if we discard old design habits, inherited from the world of minicomputers and the days of expensive electronic logic.

We need a simple microcomputer that does a large number of straightforward tasks, without offering expansion capabilities that will let you grow into a big system. If you need more computing power, you can buy another computer.

We need a portable microcomputer, so why not build a microcomputer system in a briefcase?

We need a microcomputer that uses industry standard operating systems and programming languages. We need a microcomputer with a lot of useful software packages that work as a group. What is the use of an electronic spread sheet program that is utterly incompatible with a word processor, which in turn is totally at odds with business packages? That, after all, is the state of affairs on most microcomputers sold today.

What we need is a machine that gives the budding software entrepreneur a chance; a machine that sells in very high volume, at low cost, running CP/M and using popular dialects of Basic. We need a machine that provides the entrepreneur with a customer base and an environment that offers protection from piracy and theft. We need a microcomputer manufacturer who realizes that his existence depends on the good will and cooperation of software vendors at large.

We need a microcomputer manufacturer who will offer a product with a discount schedule that makes it feasible for retailers to sell the product and make a profit.

In all my microcomputer industry endeavors I have tried to make sure that my customers got a quality product and honest support. I believe I have met these objectives at Osborne Computer Corporation.

The Osborne 1 features a standard keyboard, 5" monitor and dual floppy disk drives—in a case that qualifies as airline carry-on baggage.

Economic and Ecology Simulations

The Ecology Simulations series are a unique educational tool. They are based on "simulation models" developed by the Huntington Two Computer Project at the State University of New York at Stony Brook under the direction of Dr. Ludwig Braun. The programs and accompanying documentation are written for self-teaching or classroom use and include background material, sample exercises and study guides. Graphic displays were specially developed by Jo Ann Comito at SUNY and Ann Corrigan at Creative Computing. The Ecology Simulations packages are a remarkable educational application of micro-computers.

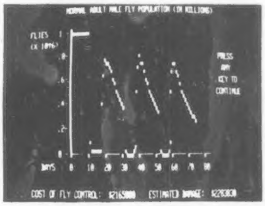
Ecology Simulations-1, CS-3201 (16K)

1. Pop

The POP series of models examines three different methods of population projection, including exponential, S-shaped or logistical, and logistical with low density effects. At the same time the programs introduce the concept of successive refinement of a model, since each POP model adds more details than the previous one.

2. Sterl

STERL allows you to investigate the effectiveness of two different methods of pest control—the use of pesticides and the release of sterile males into the fly population. The concept of a more environmentally sound approach versus traditional chemical methods is introduced. In addition, STERL demonstrates the effectiveness of an integrated approach over either alternative by itself.



3. Tag

TAG simulates the tagging and recovery method that is used by scientists to estimate animal populations. You attempt to estimate the bass population in a warm-water, bass-bluegill farm pond. Tagged fish are released in the pond and samples are recovered at timed intervals. By presenting a detailed simulation of real sampling by "tagging and recovery," TAG helps you to understand this process.

4. Buffalo

BUFFALO simulates the yearly cycle of buffalo population growth and decline, and allows you to investigate the effects of different herd management policies. Simulations such as BUFFALO allow you to explore "What if" questions and experiment with approaches that might be disastrous in real life.

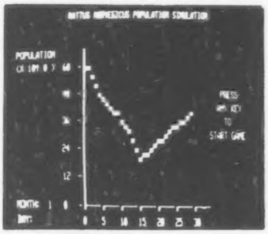
Ecology Simulations-2, CS-3202 (16K)

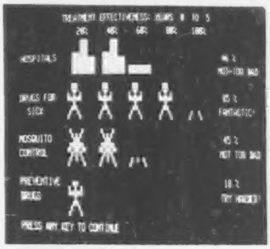
1. Pollute

POLLUTE focuses on one part of the water pollution problem; the accumulation of certain waste materials in waterways and their effect on dissolved oxygen levels in the water. You can use the computer to investigate the effects of different variables such as the body of water, temperature, and the rate of dumping waste material. Various types of primary and secondary waste treatment, as well as the impact of scientific and economic decisions can be examined.

2. Rats

In RATS, you play the role of a Health Department official devising an effective, practical plant to control rats. The plan may combine the use of sanitation and slow kill and quick kill poisons to eliminate a rat population. It is also possible to change the initial population size, growth rate, and whether the simulation will take place in an apartment building or an entire city.





3. Malaria

With MALARIA, you are a Health Official trying to control a malaria epidemic while taking into account financial considerations in setting up a program. The budgeted use of field hospitals, drugs for the ill, three types of pesticides, and preventative medication, must be properly combined for an effective control program.

4. Diet

DIET is designed to explore the effect of four basic substances, protein, lipids, calories and carbohydrates, on your diet. You enter a list of the types and amounts of food eaten in a typical day, as well as your age, weight, sex, health and a physical activity factor. DIET is particularly valuable in indicating how a diet can be changed to raise or lower body weights and provide proper nutrition.

Social and Economic Simulations
CS-3204 (16K)

1. Limits

LIMITS is a micro-computer version of the well known "Limits to Growth" project done at MIT. It contains a model of the world that is built of five subsystems (population, pollution, food supply, industrial output, and resource usage) linked together by six variables: birth rate, death rate, pollution generation, resource usage rate, industrial output growth rate, and food production rate.

2. Market

Market allows two or more people to play the roles of companies who are competing for the market for a particular product: in this case, bicycles.

Each player makes marketing decisions quarterly including the production level, the advertising budget, and the unit price of the product for his/her company.

3. USPop

USPOP allows the user to study many aspects of the United States' human demography (population change) including population growth, age and sex distribution. USPOP makes population projections and investigates the consequences of many different demographic changes.

Ordering Information

The series is designed for the 16K TRS-80 Level II and is attractively packaged in a vinyl binder with a complete study guide. *Ecology Simulations-I:* disk CS-3501, cassette 3201. *Ecology Simulations-II:* disk CS-3502, cassette CS-3202. *Social and Economic Simulations:* disk CS-3508, cassette CS-3204. At a modest $24.95 each, the series is an affordable necessity.

To order, send payment plus $2.00 for one, $3.00 for two or more for shipping and handling to Creative Computing Software, Dept. ACGG, P.O. Box 789-M, Morristown, NJ 07960. For Faster Service, call in your order toll-free to our order hotline 800-631-8112. In NJ call 201-540-0445.

The Sorcerer Reappears

Exidy
COMPU
SORC
RC

Paul Terrell, left, demonstrates the Exidy Socerer, a new Z-80 based machine, at the August 1978 Personal Computing Show in Philadelphia.

In which Paul Terrell brings us up to date on the whereabouts of the Exidy Sorcerer.

David H. Ahl

Ahl: What happened to Sorcerer? The last I knew Exidy still had it, but it was up for sale.

Terrell: We just spun out the computer division of Exidy. We formed a California Corporation called Exidy Systems Inc. of which I am president. We hired Dick Smith, the old Dynabyte marketing guy, as vice-president of marketing in the new company. We are moving into a new 12,000 square foot facility that is two miles from the parent company in Sunnyvale. This is a total separate entity. The problem we always had with computers at Exidy was that coin-op games were their first love and they didn't put enough attention, money, etc. into the computer side of the business.

Under this new direction Exidy Systems is a subsidiary of Exidy Inc. The new company has its own everything. We have our own line of credit with the Bank of America, we have our own funding and there is no game influence involved in the computer side of the house any longer.

Ahl: So the Sorcerer will now be back in production?

Terrell: It never went out of production. Over 15,000 machines are installed today. We are still shipping to Europe, although we have pulled the plug on the U.S market. After the Rec-O-Tec deal to purchase the computer division from Exidy fell through, I put together a licensing program, went to Europe in September (1980) to sell our distributor in Holland and England on the concept and they both bought the program. The Dutch company, CompuData Systems, will begin manufacturing the Sorcerer in May.

Ahl: Will they be supplying all of Europe?

Terrell: Yes, they are going to be doing the production for Europe and we are now looking for other license opportunities. We have a company interested in Hong Kong and one in Australia. Out of Sunnyvale we will be doing the production and the sales for the domestic market. We are looking at manufacturing license opportunities in Canada, Mexico, etc. We will sell them products out of Sunnyvale until we get manufacturing operations set up.

We have a lot of plans, such as a hard disk product that we will be announcing soon, and some new software. People in Europe have had Winchester disks and Pascal on the Sorcerer for several months.

Ahl: A 12,000 square foot facility doesn't sound like enough to manufacture the unit. Are you subcontracting that?

Terrell: Yes, for the first six months we are going to be buying boards that have been stuffed and flow soldered. We will be doing the test and assembly of the product. The main point is to get it away from Exidy and under its own roof.

Ahl: What has happened to the distribution since you emphasized the European market and let the U.S. market languish to some extent?

Terrell: Basically the original strategy on that was based on Pete Kaufman (President of Exidy) and I traveling to some shows in Europe and looking at the market to see how solid it was. We were convinced that it was; we liked the payment terms in dealing international (letter of credit). As soon as you ship the product you get paid. We were having some problems with the U.S. computer store market. A lot of them were underfinanced which meant we'd end up playing bank for them. It was a good business move to go to Europe. Of course, Commodore and some other people have been successful with it.

The plan was that we would come back into the U.S. market through the office equipment distribution channel. We expected that by the time we were ready to come back to the U.S. market, we would have a proven disk product line, word processor packs and small business bookkeeping software.

We did go to the office equipment show this year and are a member of NOMDA. Our show plans in 1981 are the NCC and NOMDA shows.

We are also talking to some people about a distribution program for the personal computer market, the computer store market. But we haven't concluded any agreements on that yet. Basically our whole focus and thrust is going to be in the office equipment, desk-top computer direction with a display/disk, 48K Sorcerer and daisy wheel printer. It is a systems product.

Ahl: In the time since the computer was introduced the prices have come down on many products. Is the Sorcerer still cost effective at the price?

Terrell: Very cost effective in the office equipment market. At the NOMDA show in July we showed a $6899 system. It consisted of a 48K Sorcerer at $1495, a $2995 display/disk and a $2195 daisy wheel printer. When dealers saw our product at $6899, they couldn't believe that it was a complete computer product, that it would do bookkeeping as well as word processing. We were running it with the word processor pack, but they just weren't used to anything under $10,000 that computes. My feeling was that we could have sold as many units at $9999 as we could at $6899. In fact it may have worked against us. Dealers couldn't believe that it would do order entry, inventory control, and functions like that because they were buying CPT and Vydec word processors for $15,000. ☐

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LEDGER 2 - builds and updates the JOURNAL TRANSACTION file.

LEDGER 3 - lists both the the JOURNAL file and the CHART OF ACCOUNTS.

LEDGER 4 - computes the TRIAL BALANCE and executes POSTING of journal transactions into the CHART OF ACCOUNTS. An AUDIT TRIAL of all transaction is output.

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PAY 2 - allows for changes and deletions of Transaction and Master records.

PAY 3 - reports outstanding Accounts Payables in four categories; under 30 days, 31-60 days, 61-90 days, and over 90 days.

PAY 4 - reports all outstanding Accounts Payables for a single customer or for all customers, and computes Cash Requirements.

PAY 5 - reports all outstanding Accounts Payables for a single date or for a range of dates and computes the Cash Requirements.

PAY 6 - lists both the Transactions and Master files.

PAY 7 - prints checks and accumulates and journalizes Accounts Payables. This program simultaneously creates entries for the MICROLEDGER file. **$140.00**

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An Accounts Receivable system, MICROREC includes the following programs and functions:

REC 1 - initializes Accounts Receivable files, adds A/R record and prints invoices.

REC 2 - accepts receipt of customer payments and changes or deletions of A/R Transaction or Master file records.

REC 3 - reports outstanding Accounts Receivables in four categories; under 30 days, 31-60 days, 61-90days, and over 90 days.

REC 4 - reports all outstanding Accounts Receivables for a single customer, or for all customers and computes Cash Projections.

REC 5 - produces reports for all outstanding Accounts Receivables for a single date or for a range of dates and computes Cash projections.

REC 6 - lists Transaction and Master files and accumulates and journalizes Accounts Receivables, creating JOURNAL entries which communicate with the MICROLEDGER JOURNAL file. **$140.00**

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INV 3 - lists both Transaction and Master files.

INV 4 - produces the STOCK STATUS REPORT, showing the standard inventory stock data and stock valuation, and the ABC ANALYSIS breaking down the inventory into groups by frequency of usage.

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A Ciphering Technique

Frederick Raab

Have you ever wanted to keep confidential information in the company computer—but hesitated because others would be able to read it? (And there *is* always *someone* who knows your log-on code!) The technique described here will enable you to construct a simple ciphering program based on shift-register code generators. While it won't keep the CIA and KGB out of your confidential files (will anything?), it will keep all but the most dedicated of your co-workers from making any sense out of them.

The Code Wheel

If you drank Ovaltine for breakfast in the 1940s, chances are you sent in three wrappers and became a member of Captain Midnight's Secret Squadron. If so, you were issued a badge with embossed airplane symbols that had a code wheel on the front. The letters "A" through "Z" were arranged in a circle, and by rotating a pointer from one letter to another, you could encode or decode messages.

The code wheel shown in Figure 1 might be considered an expansion of Captain Midnight's code wheel; this one contains a total of 64 symbols: the letters "A" through "Z," the numbers "0" through "9," your favorite punctuation marks and special symbols, and last but not least, the blank. Including symbols as well as letters is especially important if you want to produce an encoded text (cipertext) that looks entirely like alphabet soup and has no visible resemblance to the original text (cleartext). One of the symbols (in my program the backslash) will be used for special functions, such as carrriage return. The use of 64 symbols is convenient ($64 = 2^6$), but not absolutely necessary, and you can expand the wheel as you desire to include lower case letters and such other symbols as can be read from or written into a file.

Each symbol is associated with an integer numerical value between 0 and 63 by its position in the wheel. Coding and decoding are accomplished by modulo-64 addition and subtraction respectively, of a coding offset integer P. For example, if P = 20,

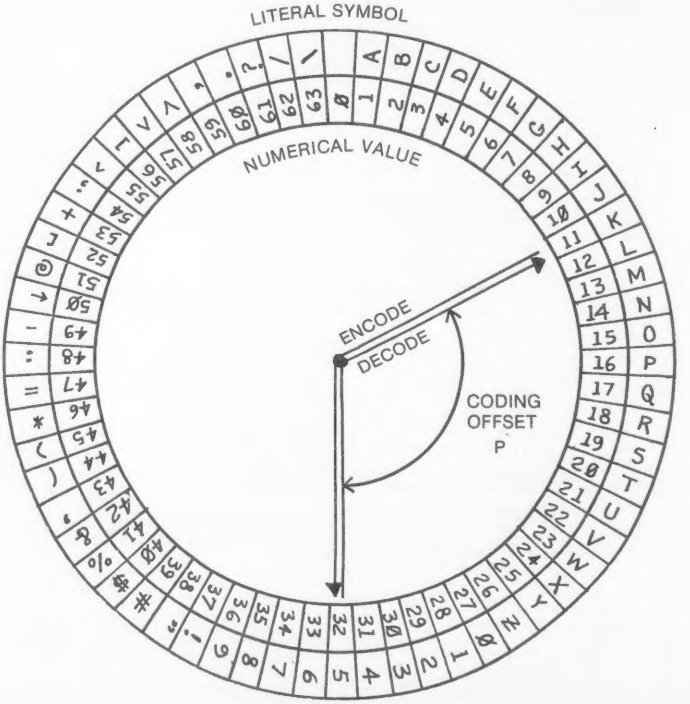

Figure 1. Code wheel.

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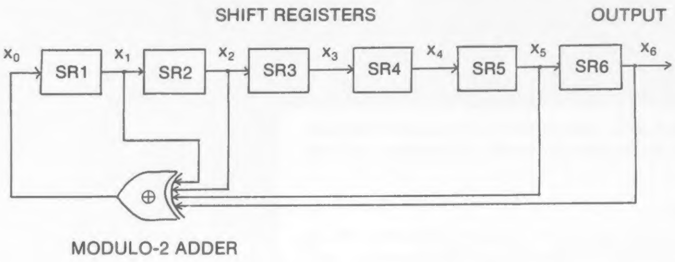

CORRESPONDING POLYNOMIAL: $f(x) = x^6 \oplus x^5 \oplus x^2 \oplus x^1 \oplus 1$

Figure 2. Linear-feedback shift-register generator.

$f_1(x) = x^{12} \oplus x^6 \oplus x^4 \oplus x^2 \oplus 1$
$f_2(x) = x^{12} \oplus x^{11} \oplus x^9 \oplus x^8 \oplus x^7 \oplus x^5 \oplus x^2 \oplus x \oplus 1$
$f_3(x) = x^{12} \oplus x^9 \oplus x^3 \oplus x^2 \oplus 1$
$f_4(x) = x^{12} \oplus x^{11} \oplus x^{10} \oplus x^8 \oplus x^6 \oplus x^4 \oplus x^3 \oplus x \oplus 1$
$f_5(x) = x^{12} \oplus x^{11} \oplus x^{10} \oplus x^5 \oplus x^2 \oplus x \oplus 1$
$f_6(x) = x^{12} \oplus x^{11} \oplus x^9 \oplus x^7 \oplus x^6 \oplus x^5 \oplus 1$
$f_7(x) = x^{12} \oplus x^{11} \oplus x^9 \oplus x^5 \oplus x^3 \oplus x \oplus 1$
$f_8(x) = x^{12} \oplus x^{10} \oplus x^6 \oplus x^5 \oplus x^2 \oplus x \oplus 1$

These and 136 more length-12 polynomials can be obtained by deciphering Appendix C in [1].

Table 1. Examples of length-12 primitive polynomials.

"K" is encoded into "5" by the formula 11 + 20 = 32. Under the rules of modulo-64 addition and subtraction, numbers less than 0 or more than 63 are mapped back into the 0–63 range, thus the "equals" sign is encoded into "C" by the formula 47 + 20 = 67 ≡ 3, given P = 20. Similarly, entire words or lines of text are encoded; "cipher" becomes "W291Y" with P = 20 for all six symbols.

The code wheel can be implemented in a program by initializing an array with the literal (string) symbols. For example:

```
INTEGER S(64)
S(1)='A'
S(2)="B"
   :
S(64)=' '
```

The above can be shortened considerably by the DATA statement if the program is written in Fortran.

A constant coding offset P produces a substitution code in which a given symbol is always encoded into the same symbol. The trouble with substitution codes is that they are very easy to break; much to my dismay, my father was able to decipher virtually every message that I encoded with my Captain Midnight badge.

To provide any real security, the coding offset P must be a sequence of numbers known only to the sender and receiver of the message. For example, if P = 10, 48, 1, 50, 11, 1, 53, ... , "cipher" becomes "M<Q>V5." One way to accomplish the pseudorandom coding offset is to use a "one-time pad" containig a sequence of random numbers between 0 and 63. Since storing the equivalent of a one-time pad is neither convenient nor safe, pseudo-random number generators are used to produce the coding offset.

Shift-Register Generators

One means of generating an apparently random (pseudorandom) binary sequence is the linear-feedback shift-register generator (LFSRG). The binary sequences produced by these generators are easily converted into pseudorandom sequences of coding offsets for use with the code wheel discussed above.

A hardware implementation of an LFSRG is depicted in Figure 2. The output of the LFSRG is (by definition) the output of the last register, SR6. Each clock pulse causes the outputs of registers SR1, SR2, ... SR6 to be shifted to the right. The input X_0 to the first register is the modulo-2 sum of the outputs of a selected set of registers ("taps") in the generator. LFSRG operation is easily implemented in software; for example, one cycle in the operation of the generator of Figure 2 is simulated by

```
X6 = X5
X5 = X4
X4 = X3
X3 = X2
X2 = X1
X1 = X0
X0 = MOD2 (X6 + X5 + X2 + X1)
OUTPUT = X6
```

The MOD2 function converts normal addition to modulo-2 addition by producing a 0 when its argument is even and a 1 when its argument is odd. For example, Fortran's integer division accomplishes this by

```
MOD2 = 1
IF(ARG/2*2.EQ.ARG) MOD2 = 0  .
```

Note that ARG, X0, X1, ... X6 must be declared to be integers if your program is written in Fortran. If you use Basic, the MOD2 function can be accomplished by truncation and comparison in a manner similar to the Fortran integer division.

Needless to say, at least one of the registers in the LFSRG must be initialized with a 1 or the generator will produce only an unending sequence of zeros. (Similarly, if an all-zeros state ever occurs in the course of operation, only zeros will be generated from then on.) If there are n registers in the generator, the number of different nonzero states of the generator, hence the maximum possible length of the binary sequence before repetition is

$$L_{max} = 2^n - 1$$

A 6-register generator can therefore produce sequences up to 63 bits long, while a 12-register generator can produce sequences up to 4095 bits long.

The length of the sequence produced by an LFSRG depends upon the particular set of feedback taps (inputs to the modulo-2 adder) used. The set of taps can be associated with the terms of a modulo-2 polynomial, as shown in Figure 2. An LFSRG that produces a maximal-length sequence (m-sequence) is associated with a primitive polynomial, which is to polynomials as a prime number is to integers. The what, why, and how of primitive polynomials is buried in the depths of abstract algebra. Fortunately, the reader who is uninterested in this form of witchcraft can simply consult published tables of polynomials and program the taps accorddingly. Some examples of length-12 primitive polynomials are given in Table 1.

Since an m-sequence produces all possible states of the generator, the initial state of the generator determines the timing or phase of the sequence, rather than what sequence will be produced. If there are L_{max} elements in the sequence, there are L_{max} different initializations. The generators in a ciphering program are initialized by keywords known only to the user.

The reader should note that the program that simulates an LFSRG need not actually use n program variables and perform n actual transfers. The bits in a single integer variable can represent the outputs of each register in the generator; for example, the state of the generator of Figure 2 can be represented by

```
Y = 32*X1 + 16*X2 + ... + 2*X5 + X6
```

Shifting is accomplished by integer (or truncated) division

```
Y = Y/2
```

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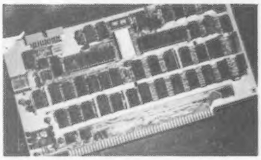

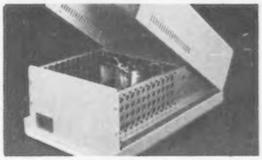

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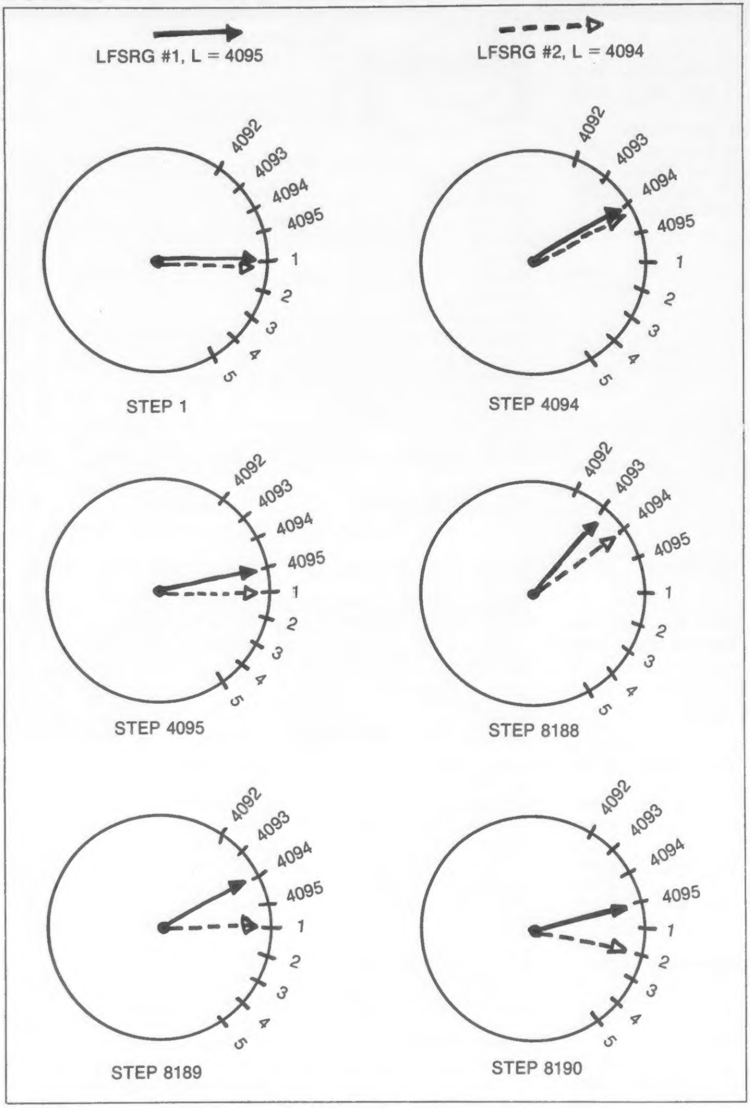

Figure 3. Length of product sequence.

Output and feedback information is produced by bit testing, which can be implemented by truncation or integer division as a library function is not available. The input to SR1 is then inserted into the first register by

Y = Y + 32*MOD2(ARG)

Product Codes

One way of obtaining longer pseudorandom sequences is to use a longer LFSRG. Another way is to take the modulo-2 sum of two or more sequences. The result is called a product sequence because its polynomial is the product of the polynomials of the two sequences that were added. The curious reader may wonder how two codes of the same length can be added bit-by-bit to produce a code of greater length. In fact, the two sequences that are added must have different lengths to produce a product code with a greater length.

It is generally quite difficult to devise a set of feedback connections that produce a pseudorandom sequence of an arbitrary length. However, a shift-register generator can be short-cycled to produce an arbitrarily shorter sequence. Short-cycling circuitry or software simply detects a specified state of the registers and then advances the generator by one or more states. Suppose that the taps of a 12-register generator are connected to produce a maximal-length sequence (L = 4095), and that the states of the generator are represented by integer values Y = 2488, 3237, 3284, 1224, 0199, ... , 2488, ... Short-cycling the generator by one step is accomplished in software by adding a statement such as

IF(Y.EQ.3284) Y = 1224

just ahead of the output step. The modified generator then produces the sequence Y= 2488, 3237, 1224, 0199, ... , 2488, ... , whose length is 4094.

The precession of the epochs (starting points) of two different sequences (i.e., sequences based upon different polynomials of the same length) with different lengths (produced by short-cycling one of the generators) causes the product sequence to have a length greater than that of either component sequence. Figure 3 illustrates the precession by representing the sequence phase of the codes produced by two 12-register generators by consecutive numbers from 1 to 4095; note that the sequence phase numbers are not the same as the state number Y used earlier. At step 1, both generators have (by definition) phase 1. Some 4093 steps later (step 4094), both generators have phase 4094. At step 4095, however, the short cycling in generator #2 advances it to phase 1, while generator #1 advances normally to phase 4095. Another 4093 steps later, we find generator #1 at phase 4093 and generator #2 at phase 4094. At the next step, short cycling again advances generator #2 an extra increment, putting it two phase increments ahead of generator #1.

This process continues until the phase of generator #2 has advanced 4094 increments ahead of the phase of generator #1. At that point, both generators cycle into phases of the same step and are therefore realigned. The length of this product sequence is therefore

$$L_p = L_1 L_2 = 4095 \cdot 4094 \approx 16.8 \cdot 10^6$$

Similarly, any number of generators can be short-cycled to produce sequences whose lengths are slightly different and contain no common factors. For example, my program uses four different 12-register generators. Three of the LFSRGs are short-cycled to produce sequence lengths of 4094, 4093 and 4092. The product sequence obtained by modulo-2 summation of the four outputs has a length of $L_p = 4095 \bullet 4094 \bullet 4093 \bullet 4092 \approx 281 \bullet 10^{12}$.

Implementing the Program

The preceding discussions have suggested how the code wheel and the shift-register sequence generators can be implemented in software. The following discussion gives suggestions for implementing other parts of the ciphering/deciphering program. The use of separate files for cleartext and ciphertext is assumed.

A pseudorandom coding offset integer

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^"*M?(Y3Y)]$;KV7#]O##E^←VC>=  -G←9%KDO*M]9GH9&F LXT5LO 5%B:E"4LWZ-/^<5U(
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3 AL8!%:VH]8>%EB(>]PSE(<7\G:O[PK-$←P9:9VY8W5^.YBPDY*5(#*3CGD←VA.]"G.]7JR
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@\A#;@%"+AT-*\58LYCAJK98C2>GC:T9O,:NL8$!]X!1V2EK%,J@=INEK$M!O;YW!.BU4"LK
R9#FK7,HQE]81&\;\<5?"WL$==)@F(9<>%:+>42XK,Q@TT#\2ETJT.K←)\(←&WIF148<V?%K
Z2^ &Q@KSK,\RO);N= D''^VRR←(]<PK.B5;(ODF+RH34;-1(F←OV;Z%.>FX(<,C U!5IP[4M
727?R?J*!;/NUJ>^B&M,/ ;@RSIO.$?V!)YI3;!N53NC+[*&RJ3#6=HNV>O7VQ!M&1C/M6^
O(OQ:=←OO4L*<LC')=T/(,I!W2E?U9*9$*ORVEPO4MMV.=B.\JV?.VF*'&2:FOU^W6UFNKY4
ZG+O←.EVOO-DD:X9YL3+U4YOJ\8$>"(OFU OGMU7 4UY2FPS[!AIE$+8T&I=O298 -←17FWC
#ABR ZF]E1&?M S;.O'*5#,>3ES>"8QGO[V.(LC,*2I←9H"'@L4&GZ 2G@N2&;S@J(<6BT]I
T'H]4#IIB7$OK@F*1;H..9NO>B"=)O&H([O,N1%"Z\"7#LQO;1\FOD"#/6+C.!LH/]O- C@,
S-?"IH3KL)+!:]D-?,,(+-U7EJ#9"K*42UMIU74<YM←!#AGQ\F8OG[@);B@"Q"X\=K !KBIN
BZW^>!LKU4><$ ++Q9V\(/N@*8HIL494/S#.1V56IH*X3OXLFE$U/7=9SRN9(]$88]IV,/!W
,?%]7*(3Z##IY*R?F:;I=D)OFQY<PL:IL!O)DS-5;=C4"=W+-V='O.=->\O1KXE-3DM[X>8"
OK*T]%F)2!(WK#S.@^$<@M:% HP)QWJNK&*)<\<?@G/I
```

Figure 4. Example ciphertext file.

between 0 and 63 is easily obtained from six sequential output bits from the binary code generator by

$$P = 32*B1 + 16*B2 + \ldots + B6$$

Encoding of a symbol from the cleartext file is accomplished by first matching it to S(J), thereby obtaining index J, and then computing and writing S(MOD2(P + J)) to the ciphertext file. Decoding is similarly accomplished by matching the ciphertext symbol to S(K) to find index K and then writing S(MOD2(K - P)) to the cleartext file.

The reader may now be asking what real good is accomplished by having a ciphering program in his or her directory that can presumably be used by anyone having access to the ciphertext files. The trick is to use keywords to initialize the shift-register generators. As with mechanical locks—everyone knows where they are and how to use them, but only you have the key. If your code generator produces a sequence $281 \bullet 10^{12}$ bits long, it can be started in $281 \bullet 10^{12}$ different places and can produce $281 \bullet 10^{12}$ different alphabet soups from the same cleartext file. Needless to say, there are therefore $281 \bullet 10^{12}$ possible keywords.

Keywords are not the sort of thing you want to list in a file—any more than you leave your door keys hanging beside the door. I find it easier to remember a short alphanumeric sequence than a longer numerical sequence. The code wheel symbol table can be used to convert an alphanumeric keyword into sequences of bits that initialize the LFSRGs. It is convenient to use a compatible number of symbols and number of registers. For example, one symbol of the 64 in the code wheel of Figure 1 specifies six bits and therefore initializes six registers in an LFSRG. Two alphanumeric symbols therefore initialize one 12-register generator and eight symbols initialize a code generator employing four 12-register generators. Remember that an adjacent pair of blanks (Figure 1) may initialize one of the generators to an all-zeros state, thereby effectively disabling it. (I included software to check for this and issue a warning if it occurred.)

One can simply substitute a ciphertext symbol in place of a cleartext symbol without changing the format. However, as with Captain Midnight's badge, the format of the ciphertext then gives even the casual observer a pretty good clue about what the cleartext is (computer program, checkbook, letter, etc.). I therefore use a pair of buffers to reformat the cleartext before encoding and after decoding. Cleartext is read into the first buffer with backslashes (\ ) separating different lines. When the buffer is full, it is encoded and written to the ciphertext file. The unencoded portion of the first buffer is then shifted left and the next line of cleartext read into the buffer to the right of the remaining unencoded data. The resultant ciphertext (Figure 4) is line after line of 72-symbol alphabet soup, regardless of the format of the cleartext.

The curious reader may wonder how two codes of the same length can be added bit-by-bit to produce a code of greater length.

Decoded ciphertext is similarly first placed in one of the buffers to the right of previously decoded text. When a backslash is detected, the contents of the buffer to the left of the backslash are written to the cleartext file as a single line. The unwritten portion of the buffer (to the right of the backslash) is then shifted left and the next line of ciphertext is decoded and placed to its right in the buffer.

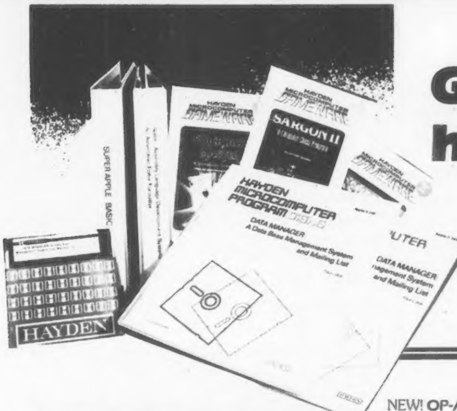
All symbols in my code wheel are compatible with almost any file read and write statements. Symbols such as TAB (control I) or BELL (control G) are simply passed without encoding or decoding; the alternatives are aborting the program or expanding the codewheel. Long strings of blanks occur frequently in many types of cleartext and facilitate breaking the code. My program therefore replaces a string of N blanks with \N\ , where N is a two-digit integer. If this option is used, the carriage-return symbol becomes \\ , rather than \ . You may wish to devise a few special procedures to suit your particular cleartext.

How Safe Is It?

If you are going to use a ciphering technique to protect your confidential data from the eyes of your co-workers, you should know in advance how safe it really is. Consider first the monkey-at-the-keyboard approach to breaking the code in which all possible alphanumeric keywords are eventually tried. If it takes one second to make a decision whether the deciphered text is alphabet soup or useful information, it will take $1/2 \bullet 281 \bullet 10^{12}$ seconds or 4.45 million years to have tried half of the possible keywords and thereby have a 50-50 chance of having deciphered the information. The utility of the 8-character keyword for keeping the passively curious out of your data is immediately obvious.

Someone with determination, programming ability, and a smattering of abstract algebra can do somewhat better. Suppose that corresponding sequences of eight symbols in both the clear text and ciphertext are known to the would-be codebreaker. The differences between corresponding symbols produces a sequence of eight coding offsets, hence $8 \bullet 6$ sequential binary outputs of the pseudorandom sequence generator. If the sequence generator employed a single 48-register LFSRG, these 48 bits would initialize it and it could be moved forward and backward to decipher the rest of the text.

It is not quite that simple if the sequence generator uses four 12-register LFSRGs. Abstract algebra must be used to convert the 48 sequential bits into four sets of 12 bits to initialize the four individual LFSRGs. In addition, the would-be codebreaker probably does not know exactly where in the text a particular sequence occurs. He or she must therefore assume that some sequence of eight characters (e.g., WRITE(10, CHECK NO) occurs and is followed by another machine-recognizable sequence (e.g., FORMAT(,BALANCE). The would-be codebreaker must then write a program that assumes that the first sequence occurs at a particular location, derives the coding offset sequence, initializes the code generator, and deciphers up to a preset portion of the subsequent ciphertext. If the second sequence shows up in the deciphered text, the probability is very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Tales from the Crypt

Dear Editor:

I read with interest the article on Cryptography by N.B. Winkless in the May 1980 edition of *Creative Computing*. However, I think young Stan has a lot to learn if he wishes to protect his messages against attack by modern cryptanalysts.

The pseudo-random generator method of encryption is open to fairly easy attack. Stan assumes that it is necessary to find the "seed" he used for encrypting his message, but this is not the case. To see why, it is necessary to look at the methods used for generating random numbers. One common technique is to use the formula

$R_{n+1} = (a R_n + c) \bmod m$

where a, c and m are constants and R_n and R_{n+1} are successive random numbers. These constants must be carefully chosen if the sequence generated is to have suitable random properties.

Let us suppose the pseudo-random generator used in Stan's computer is of this form and has the values

a=24298
c=9991
m=199017

but we don't know the seed R_0 selected by Stan. It would appear that we may need to try up to 199017 seeds before we can crack the code, but things aren't as bad as that. If we intercept a message from Stan of about 200 characters (2 or 3 sentences) we can proceed with our cryptanalysis as follows.

Firstly we pick a trial "seed" R_x and test it against the string of encrypted characters. If nothing meaningful emerges we try again with the same R_x but starting with the second character in the string. We carry on until the message is deciphered or we get within five or six characters of the end (we need a few characters to recognize a successful decipherment). If this fails we repeat the whole procedure with another value of R_x.

It might seem that an enormous number of values of R_x need be tried before we succeed, but the number need not be that large.

The probability of failing with one value of R

$=(1-\frac{195}{199017})$

and the probability of failing with n values of R

$= (1-\frac{195}{199017})^n$

For n = 1000 probability of failure = .375
For n = 3000 probability of failure = .053

Thus with only 3000 tries we have a 95% chance of success. The situation improves with longer messages. If the message length is 1000 characters then

For n = 600 probability of failure = .049

Obviously decryption can be made more difficult with a larger value of m, but given a reasonably long string the task is still manageable.

A computer can carry out the tests very rapidly and filter out unlikely answers based on letter distribution, impossible pairs of letters, etc. This can reduce human intervention to a minimum.

Only one problem remains. Having found a starting seed in the middle of the string, how can we work backward to the beginning of the string?

The method requires finding the inverse of "a", i.e. we want an integer i such that

a x i mod m = 1

This can be solved using continued fractions (interesting in their own right). For the values a and m in the example i = 45319.

To illustrate how this can be used suppose $R_n = 15$ then

$R_{n+1} = (15 \times 24298 + 991) \bmod 199017 = 175444$

To go back we use i

$R_n = ((175444-9991) \times 45319) \bmod 199017 = 15$

Stan has a further problem: namely, what seed does he use for his next message?

1) Continue from where he left off.
2) Start again with the same seed
3) Use a completely new seed.

If he chooses option (1) then all he is doing is extending the effective message length, aiding decryption.

If he takes option (2) he is in even worse trouble. An interceptor could line up the two messages and subtract one from the other modulo 26, which would remove the random coding and combine the two messages into what is called a running key code. Suppose the nth characters in the two messages were X and A respectively and the encoding character R.

Then the relevant encoded characters are

Message 1. X + R = P
Message 2. A + R = S

When subtracted we get

(X + R) - (A + R) = X - A = W

and we can see that R has been removed.

We now have two plaintext strings subtracted from each other and if we know one we can determine the other. The messages can now be deciphered by trying common words in each position of one message and seeing what this produces in the other. We can then extend both messages bit by bit until the two messages have been extracted.

So, in practice, Stan is left with only one option (3) and he runs into a major problem of cryptography—"key distribution" i.e. how do you get your key ("seed") to the other end without risk?

Stan might do well to look into the latest approach to encryption—namely, public key encryption—but that is another story.—*Mike Bennett, 36 A Bedford Rd., Northwood, Middlesex, England HA6 2AZ.*

---

high that the code has been broken. If it doesn't show up in the allowed number of symbols, the program must shift the location of the first sequence and try again. Needless to say, this technique takes some time and determination on the part of the would-be codebreaker. Pilfering your desk should prove somewhat easier.

If you're still worried about the would-be codebreakers, you can complicate the ciphering program in several ways: (1) Use one additional random sequence generator to insert symbols produced by another additional random sequence generator at random locations in the ciphertext. (2) Use substitution codes before and/or after encoding by the pseudorandom sequence generator; the difficulty here is the length of the keywords that specify the substitution codes. (3) Include nonlinear operations (jumps, multiplications, changes in tap connections) in the shift-register generators. (4) Use the NBS data encryption algorithm, which is based on different principles.

In any case, the technique described here should allow you to construct a ciphering program that will keep almost everyone out of your files. Exploring improved variations can keep you busy for years to come. ☐

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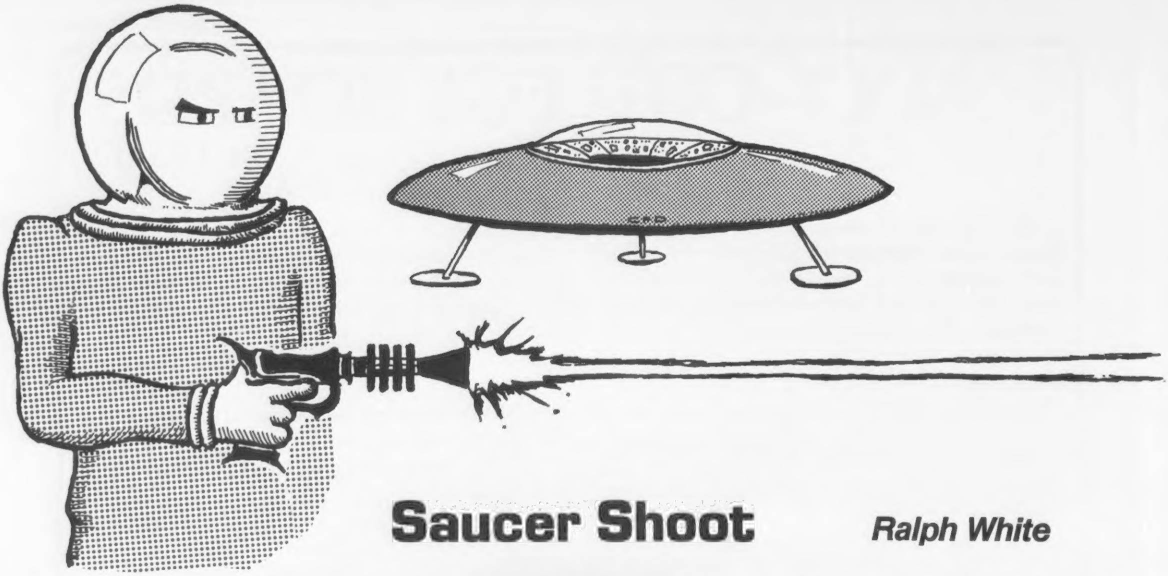


Saucer Shoot

Ralph White

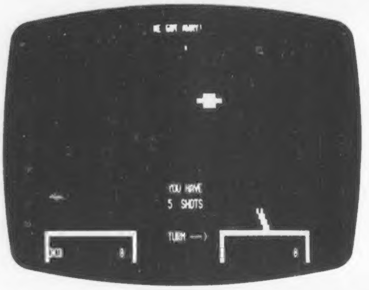
The accompanying *Saucer Shoot* program, written in Radio Shack Level II Basic, demonstrates that those of us not experienced in machine language need not be limited to static displays. We too can provide movement and animation to bring our screens to life. It also dispels the notion that an educational program must be dull.

The program mixes the environment of a TV arcade game with percentage problems. The result, which is used in a junior high classroom, helps make percentage drill problems palatable. Even the most unmotivated child likes to play games. By camouflaging the purpose of the program, perhaps we can convince an otherwise unwilling student to work problems that would normally be untouched.

Saucer Shoot is written for two players to compete against each other. The computer is a neutral nonparticipant. It randomly thinks of problems to befuddle the players and does the housekeeping chores required to referee the game.

The program combines competition, animation and CAI to achieve its purpose—which is that the players will become better aquainted with percentage problems without experiencing the drudgery.

The computer alternately presents the players with problems. Each player may choose any one of five levels of difficulty for each turn. If the question is answered correctly, the player gets to shoot at flying saucers. The number of shots is directly related to the level of difficulty chosen. A player gets one shot for choosing a level 1 (easiest) question, two shots for a level 2 question, on up to five shots for successfully answering a level 5 (hardest) question. If the question is not answered correctly, the correct answer will be displayed and then play will pass to the other player. The first player to shoot down ten flying saucers wins.



After a player answers a question, a little head will rise up from the proper gun emplacement, turn, look at the answer, and nod "yes" or "no" in response to whether the answer is right or not. If the answer is correct then the player is allowed to shoot at flying saucers that move across the screen. The saucers fly at various heights, and may appear on either side of the screen. Only one shot at each saucer is allowed. When a saucer is hit, it explodes and shatters into pieces.

Animation is provided by a series of strings that are comprised of graphics characters. There are 28 different strings that are needed to supply movement of the heads and fourteen strings that create the flying saucers and explosions. This procedure of printing strings of graphics characters rather than employing the SET and RESET commands increases the speed of the graphics to the point that smooth animation is possible. ☐

Ralph G. White, 529 South Vermont, Columbus, KS 66725.

```
10
10 CLS:CLEAR(400):DL=20
12 DIMH$(30),S$(15)
15 BL$(1)="    ":BL$(2)="                                        "
20 P(1)=919:P(2)=929:A$(1)="<---":A$(2)="--->"
25 TL$="##################"
50 PRINTCHR$(23):PRINT:PRINT:PRINT:PRINTTL$;TL$
52 PRINTTAB(10)"SAUCER SHOOT":PRINT:PRINTTAB(11)"PERCENTAGE":PRINT
54 PRINTTL$;TL$
100 GOSUB10000
200 CLS:PRINTTAB(20)"S A U C E R    S H O O T":PRINTTAB(26)"INSTRUCTIONS":PRINT
210 PRINT"THE PROBLEMS IN THIS PROGRAM ASK YOU TO FIND THE PERCENT OF A"
215 PRINT"NUMBER.  THERE ARE 5 LEVELS OF DIFFICULTY.  YOU CHOOSE THE ONE"
220 PRINT"YOU WISH (1-EASIEST : 5-HARDEST).  IF YOU ANSWER THE QUESTION"
225 PRINT"CORRECTLY, YOU GET TO SHOOT AT FLYING SAUCERS.  THE NUMBER OF"
230 PRINT"SHOTS YOU GET DEPENDS ON WHICH LEVEL OF DIFFICULTY IS CHOSEN."
235 PRINT"LEVEL 1 ALLOWS YOU ONE SHOT, LEVEL 2 GETS TWO SHOTS AND SO ON.
240 PRINT"THE FIRST PLAYER TO SCORE TEN HITS IS THE WINNER."
241 PRINT"TO SHOOT AT THE SPACE SHIPS PRESS THE SPACE BAR.  YOU GET ONE"
242 PRINT"SHOT AT EACH SAUCER.":PRINT
245 INPUT"WHAT IS THE NAME OF THE FIRST PLAYER ";N$(1)
246 IFLEN(N$(1))<10GOTO250
247 PRINT"NAME TOO LONG.  10 LETTERS OR LESS, PLEASE":GOTO245
250 INPUT"WHAT IS THE NAME OF THE SECOND PLAYER ";N$(2)
251 IFLEN(N$(2))<10GOTO260
252 PRINT"NAME TOO LONG.  10 LETTERS OR LESS, PLEASE":GOTO250
260 CLS
500 FORI=0TO41:SET(0+I,42):SET(80+I,42):NEXT
510 FORI=0TO4:SET(0,43+I):SET(1,43+I):SET(40,43+I):SET(41,43+I):SET(80,43+I):SET
(81,43+I):SET(120,43+I):SET(121,43+I):NEXT
700 P=RND(2)
```

The Sinclair ZX80 is innovative and powerful. Now there's a magazine to help you get the most out of it.

Get in sync

The magazine for Sinclair ZX80 users
SYNC

SYNC magazine is different from other personal computing magazines. Not just different because it is about a unique computer, the Sinclair ZX80 (and kit version, the MicroAce). But different because of the creative and innovative philosophy of the editors.

A Fascinating Computer

The ZX80 doesn't have memory mapped video. Thus the screen goes blank when a key is pressed. To some reviewers this is a disadvantage. To our editors this is a challenge. One suggested that games could be written to take advantage of the screen blanking. For example, how about a game where characters and graphic symbols move around the screen while it is blanked? The object would be to crack the secret code governing the movements. Voila! A new game like Mastermind or Black Box uniquely for the ZX80.

We made some interesting discoveries soon after setting up the machine. For instance, the CHR$ function is not limited to a value between 0 and 255, but cycles repeatedly through the code. CHR$ (9) and CHR$ (265) will produce identical values. In other words, CHR$ operates in a MOD 256 fashion. We found that the "=" sign can be used several times on a single line, allowing the logical evaluation of variables. In the Sinclair, LET X=Y=Z=W is a valid expression.

Or consider the TL$ function which strips a string of its initial character. At first, we wondered what practical value it had. Then someone suggested it would be perfect for removing the dollar sign from numerical inputs.

Breakthroughs? Hardly. But indicative of the hints and kinds you'll find in every issue of **SYNC**. We intend to take the Sinclair to its limits and then push beyond, finding new tricks and tips, new applications, new ways to do what couldn't be done before. **SYNC** functions on many levels, with tutorials for the beginner and concepts that will keep the pros coming back for more. We'll show you how to duplicate commands available in other Basics. And, perhaps, how to do things that can't be done on other machines.

Many computer applications require that data be sorted. But did you realize there are over ten fundamentally different sorting algorithms? Many people settle for a simple bubble sort perhaps because it's described in so many programming manuals or because they've seen it in another program. However, sort routines such as heapsort or Shell-Metzner are over 100 times as fast as a bubble sort and may actually use less memory. Sure, 1K of memory isn't a lot to work with, but it can be stretched much further by using innovative, clever coding. You'll find this type of help in **SYNC**.

Lots of Games and Applications

Applications and software are the meat of **SYNC**. We recognize that along with useful, pragmatic applications, like financial analysis and graphing, you'll want games that are fun and challenging. In the charter issue of **SYNC** you'll find several games. Acey Ducey is a card game in which the dealer (the computer) deals two cards face up. You then have an option to bet depending upon whether you feel the next card dealt will have a value between the first two.

In Hurkle, another game in the charter issue, you have to find a happy little Hurkle who is hiding on a 10 X 10 grid. In response to your guesses, the Hurkle sends our a clue telling you in which direction to look next.

One of the most ancient forms of arithmetical puzzle is called a "boomerang." The oldest recorded example is that set down by Nicomachus in his *Arithmetica* around 100 A.D. You'll find a computer version of this puzzle in **SYNC**.

Hard-Hitting, Objective Evaluations

By selecting the ZX80 or MicroAce as your personal computer you've shown that you are an astute buyer looking for good performance, an innovative design and economical price. However, selecting software will not be easy. That's where **SYNC** comes in. **SYNC** evaluates software packages and other peripherals and doesn't just publish manufacturer descriptions. We put each package through its paces and give you an in-depth, objective report of its strengths and weaknesses.

SYNC is a Creative Computing publication. **Creative Computing** is the number 1 magazine of software and applications with nearly 100,000 circulation. The two most popular computer games books in the world, *Basic Computer Games* and *More Basic Computer Games* (combined sales over 500,000) are published by Creative Computing. Creative Computing Software manufactures over 150 software packages for six different personal computers.

Creative Computing, founded in 1974 by David Ahl, is a well-established firm committed to the future of personal computing. We expect the Sinclair ZX80 to be a highly successful computer and correspondingly, **SYNC** to be a respected and successful magazine.

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Needless to say, we can't fill up all the pages without your help. So send in your programs, articles, hints and tips. Remember, illustrations and screen photos make a piece much more interesting. Send in your reviews of peripherals and software too—but be warned: reviews must be in-depth and objective. We want you to respect what you read on the pages of **SYNC** so be honest and forthright in the material you send us. Of course we pay for contributions—just don't expect to retire on it.

The exploration has begun. Join us.

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SYNC

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CIRCLE 218 ON READER SERVICE CARD

Saucer Shoot, continued...

```
710 PRINT@961,N$(1);:PRINT@1001,N$(2);
800 PRINT@924,"TURN";
805 PRINT@976,S(1);:PRINT@1016,S(2);
810 PRINT@P(P),A$(P);
820 PRINT@349,"CHOOSE":PRINT@411,"A LEVEL OF":PRINT@475,"DIFFICULTY";:PRINT@540,
"(1 -- 5)
900 A$=INKEY$:IFA$=""GOTO900
910 VL=ASC(A$):IFVL<49ORVL>53GOTO900
920 D=VAL(A$)
950 PRINT@349,S$(14);:PRINT@411,S$(14);:PRINT@475,S$(14);:PRINT@540,S$(14);
1000 ONDGOTO1010,1020,1030,1040,1050
1010 PC=RND(3)*25:NU=RND(20)*20:GOTO1500
1020 PC=RND(4)*20:NU=RND(50)*10:GOTO1500
1030 PC=RND(9)*10:NU=RND(50)*10:GOTO1500
1040 PC=RND(19)*5:NU=RND(20)*20:GOTO1500
1050 PC=RND(24)*4:NU=RND(16)*25
1500 AN=NU*PC/100
1510 PRINT@670,"WHAT  IS":PRINT@729," ";:PRINTPC;"% OF ";NU;
1515 PRINT@794," ";:INPUTEX$
1516 PRINT@200," "
1518 IFLEN(EX$)=0GOTO1515
1520 NV=VAL(EX$):FV=0
1530 FORI=1TOLEN(EX$)
1535 EV=ASC(MID$(EX$,I,1))
1540 IFEV<48OREV>57THENFV=1
1560 IFFV=0GOTO1580
1570 PRINT@794,"         ";:GOTO1515
1580 HT=782:HB=846:IFP=1GOTO1600
1590 HT=809:HB=873
1600 FORI=1TO3:PRINT@HB,H$(I);:FORTM=1TODL:NEXT:NEXT
1610 FORI=1TO2:PRINT@HT,H$(I);:PRINT@HB,H$(I+3);:FORTM=1TODL:NEXT:NEXT
1620 PRINT@HT,H$(6);:PRINT@HB,H$(7);:FORTM=1TODL:NEXT
1630 FORTM=1TODL:NEXT
1650 ONPGOTO1800,1900
1800 FORI=9TO15STEP2:PRINT@782,H$(I);:PRINT@846,H$(I+1);:FORTM=1TODL:NEXT:NEXT
1820 FORTM=1TO300:NEXT
1825 FORI=13TO9STEP-2
1830 PRINT@782,H$(I);:PRINT@846,H$(I+1);:FORTM=1TODL:NEXT
1835 NEXT
1840 PRINT@782,H$(6);:PRINT@846,H$(7);:FORTM=1TODL:NEXT
1890 GOTO2000
1900 FORI=17TO23STEP2:PRINT@809,H$(I);:PRINT@873,H$(I+1);:FORTM=1TODL:NEXT:NEXT
1910 FORTM=1TO300:NEXT
1920 FORI=21TO17STEP-2
1925 PRINT@809,H$(I);:PRINT@873,H$(I+1);:FORTM=1TODL:NEXT
1930 NEXT
1940 PRINT@809,H$(6);:PRINT@873,H$(7);:FORTM=1TODL:NEXT
2000 IFNV=ANGOTO2100
2005 FORI=1TO3
2010 PRINT@HT,H$(9);:PRINT@HB,H$(10);:FORTM=1TODL*2:NEXT
2020 PRINT@HT,H$(6);:PRINT@HB,H$(7);:FORTM=1TODL*2:NEXT
2030 PRINT@HT,H$(17);:PRINT@HB,H$(18);:FORTM=1TO2*DL:NEXT
2040 PRINT@HT,H$(6);:PRINT@HB,H$(7);:FORTM=1TO2*DL:NEXT
2050 NEXT
2060 FORI=2TO1STEP-1:PRINT@HT,H$(I);:PRINT@HB,H$(I+3);:FORTM=1TODL:NEXT:NEXT
2062 PRINT@HT,H$(8);
2065 FORI=3TO1STEP-1:PRINT@HB,H$(I);:FORTM=1TODL:NEXT:NEXT
2070 PRINT@HB,H$(8);:FORTM=1TODL:NEXT
2080 GOTO2200
2100 FORI=1TO3
2110 PRINT@HT,H$(25);:PRINT@HB,H$(26);:FORTM=1TO2*DL:NEXT
2120 PRINT@HT,H$(6);:PRINT@HB,H$(7);:FORTM=1TO2*DL:NEXT
2130 PRINT@HT,H$(27);:PRINT@HB,H$(28);:FORTM=1TO2*DL:NEXT
2140 PRINT@HT,H$(6);:PRINT@HB,H$(7);:FORTM=1TO2*DL:NEXT
2150 NEXT
2160 FORI=2TO1STEP-1:PRINT@HT,H$(I);:PRINT@HB,H$(I+3);:FORTM=1TODL:NEXT
2162 PRINT@HT,H$(8);
2165 FORI=3TO1STEP-1:PRINT@HB,H$(I);:FORTM=1TODL:NEXT:NEXT
2170 PRINT@HB,H$(8);:FORTM=1TODL:NEXT
2180 PRINT@670,S$(14);:PRINT@729,S$(14);:PRINT@786,S$(14);
2190 GOTO2300
2200 PRINT@786,S$(14);:PRINT@787,"THE CORRECT ANSWER IS ";AN;
2210 FORTM=1TO3000:NEXT
2220 PRINT@786,BL$(2);:PRINT@P(P),BL$(1);
2230 PRINT@670,BL$(2);:PRINT@729,BL$(2);
2240 IFP=2GOTO2270
2250 P=P+1:GOTO800
2270 P=P-1:GOTO800
2300 PRINT@724,BL$(2);:PRINT@729,BL$(2);:PRINT@786,BL$(2);
2310 PRINT@732,"YOU HAVE";:PRINT@795,D;" SHOTS";
2390 FORTM=1TO1500:NEXT
2400 H=RND(6):SH=64*H:EN=SH+56
2410 DR=RND(2):IFDR=2GOTO2430
2420 BG=SH:ST=EN:IN=1:GOTO2500
2430 BG=EN:ST=SH:IN=-1
2500 IFP=2GOTO2800
2600 FORI=0TO3:FORJ=0TO2:SET(19+I+J,41-I):NEXT:NEXT
2601 X=26:Y=35
2605 PRINT@BG,S$(1);
2610 A$=INKEY$:IFA$=""GOTO2630
2620 IFASC(A$)=32GOTO2700
```

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CIRCLE 189 ON READER SERVICE CARD

Prob-
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by Steve Rogowski

Ninety intriguing and fascinating problems, each thoroughly discussed and referenced, make an excellent source of exercises in research and preliminary investigation. Eleven types of problems are provided in the following areas: arithmetic, algebra, geometry, trigonometry, number theory, probability, statistics, calculus and science. Author Stephen Rogowski of SUNY-Albany has included several problems which have never been solved. He feels that some research and an attempt to solve these will sharpen students' insight and awareness.

Some of the problems are not new like the one asking how much the $24 the Indians were paid for Manhattan would be worth today had it been deposited in a bank. However, this problem was revised to have a variable interest rate so it would be a challenge to program. Of course, many of the problems are new and have never been in print before.

The student edition has 106 pages and includes all 90 problems (with variations), 7 appendices and a complete bibliography. Cost is $4.95.

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CIRCLE 300 ON READER SERVICE CARD

Saucer Shoot, continued...

```
2630 BG=BG+IN:IFBG=STGOTO3100
2640 GOTO2600
2700 BG=BG+IN:IFBG=STGOTO3100
2710 PRINT@BG,S$(1);
2720 RESET(X-3,Y+3):SET(X,Y)
2730 CK=POINT(X+3,Y-3):IFCK=-1GOTO3000
2740 X=X+3:Y=Y-3:IFY<5GOTO3100
2750 GOTO2700
2800 FORI=0TO3:FORJ=0TO2:SET(100-I+J,41-I):NEXT:NEXT
2801 X=95:Y=35
2805 PRINT@BG,S$(1);
2810 A$=INKEY$:IFA$=""GOTO2830
2820 IFASC(A$)=32GOTO2900
2830 BG=BG+IN:IFBG=STGOTO3100
2840 GOTO2800
2900 BG=BG+IN:IFBG=STGOTO3100
2910 PRINT@BG,S$(1);
2920 RESET(X+3,Y+3):SET(X,Y)
2930 CK=POINT(X-3,Y-3):IFCK=-1GOTO3000
2940 X=X-3:Y=Y-3:IFY<5GOTO3100
2950 GOTO2900
3000 PRINT@BG-64,S$(2);:PRINT@BG,S$(3);:PRINT@BG+64,S$(4);:FORTM=1TO2*DL:NEXT
3010 PRINT@BG-64,S$(5);:PRINT@BG,S$(6);:PRINT@BG+64,S$(7);:FORTM=1TODL:NEXT
3020 PRINT@BG-1,S$(8);:PRINT@BG+63,S$(9);:FORTM=1TODL+10:NEXT
3030 PRINT@BG-2,S$(10);:PRINT@BG+62,S$(11);:FORTM=1TODL:NEXT
3040 PRINT@BG-3,S$(12);:PRINT@BG+61,S$(13);:FORTM=1TODL:NEXT
3045 PRINT@BG-3,S$(14):PRINT@BG+61,S$(14);
3050 S(P)=S(P)+1:IFS(P)>9GOTO3200
3055 FORTM=1TO800:NEXT
3060 D=D-1:IFD>0GOTO2310
3070 GOTO2220
3100 PRINT@25,"HE GOT AWAY!";
3110 FORTM=1TO1800:NEXT
3115 PRINT@BG,S$(5);:PRINT@25,S$(14);:RESET(X,Y)
3117 PRINT@89,S$(14);:PRINT@151,S$(14);:PRINT@215,S$(14);
3120 GOTO3060
3200 CLS:PRINTCHR$(23):PRINT
3210 PRINTTAB(5);N$(P)
3220 PRINT"IS THE WINNER!":PRINT:PRINT
3230 PRINTN$(P);" SAVED THE WORLD"
3240 PRINT"FROM THE INVADERS FROM MARS!"
3250 END
3330 END
10000 FORH=1TO28:FORI=1TO6:READCH:H$(H)=H$(H)+CHR$(CH):NEXT:NEXT
10010 FORS=1TO7:FORI=1TO8:READCH:S$(S)=S$(S)+CHR$(CH):NEXT:NEXT
10020 FORS=8TO9:FORI=1TO10:READCH:S$(S)=S$(S)+CHR$(CH):NEXT:NEXT
10030 FORS=10TO11:FORI=1TO12:READCH:S$(S)=S$(S)+CHR$(CH):NEXT:NEXT
10040 FORS=12TO13:FORI=1TO14:READCH:S$(S)=S$(S)+CHR$(CH):NEXT:NEXT
10050 S$(14)=STRING$(14,CHR$(128))
10060 RETURN
11000 DATA128,176,176,176,176,128
11001 DATA128,188,188,188,188,128
11002 DATA160,191,175,159,191,144
11003 DATA136,191,187,183,191,132
11004 DATA130,191,158,173,191,129
11005 DATA160,191,175,159,191,144
11006 DATA128,143,183,187,143,128
11007 DATA128,128,128,128,128,128
11008 DATA160,191,159,191,175,144
11009 DATA128,143,191,179,143,128
11010 DATA128,191,191,175,159,128
11011 DATA128,143,191,183,139,128
11012 DATA128,191,191,159,191,128
11013 DATA128,143,191,191,139,128
11014 DATA128,191,191,191,175,128
11015 DATA128,143,191,191,143,129
11016 DATA160,159,191,175,191,144
11017 DATA128,143,179,191,143,128
11018 DATA128,175,159,191,191,128
11019 DATA128,135,187,191,143,128
11020 DATA128,191,175,191,191,128
11021 DATA128,135,191,191,143,128
11022 DATA128,159,191,191,191,128
11023 DATA130,143,191,191,143,128
11024 DATA160,191,187,183,191,144
11025 DATA128,143,189,190,143,128
11026 DATA160,191,191,191,191,144
11027 DATA128,143,158,173,143,128
11028 DATA128,140,174,191,191,157,140,128
11029 DATA128,160,176,176,176,176,144,128
11030 DATA174,179,145,191,191,162,179,157
11031 DATA128,130,131,131,131,131,129,128
11032 DATA128,128,128,128,128,128,128,128
11033 DATA140,136,133,190,189,138,132,140
11034 DATA128,128,129,129,130,130,128,128
11035 DATA176,160,133,132,162,145,136,138,144,176
11036 DATA128,136,136,129,129,130,130,132,132,128
11037 DATA128,128,152,160,128,132,136,128,144,164,128,128
11038 DATA131,146,160,136,162,191,191,145,132,144,161,131
11039 DATA128,128,160,128,128,128,128,128,128,128,128,144,128,128
11040 DATA130,153,161,130,152,160,129,130,144,164,129,146,166,129
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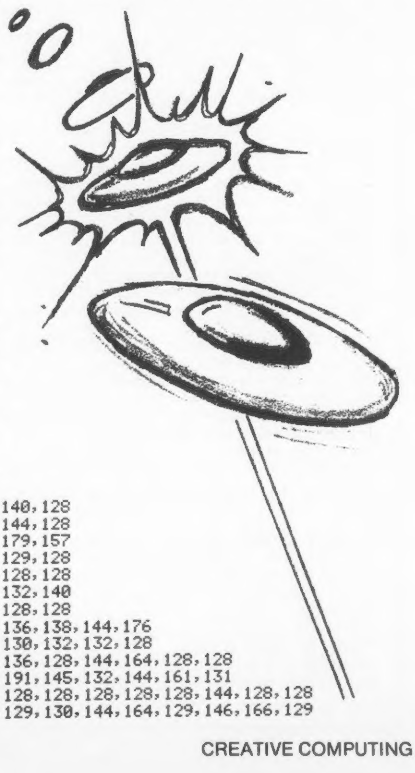

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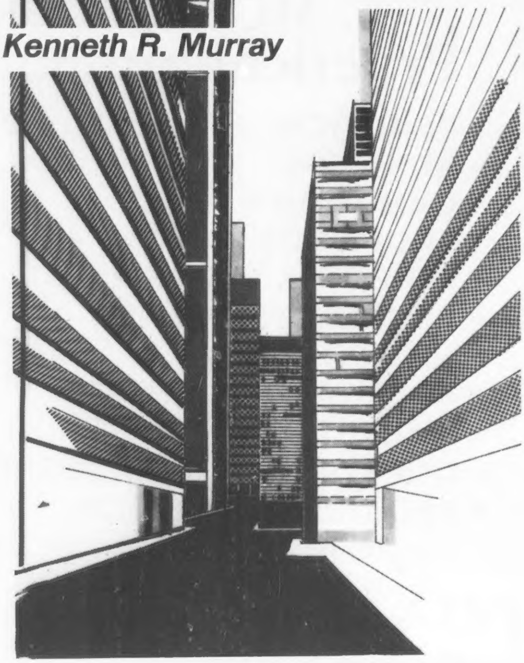
CIRCLE 138 ON READER SERVICE CARD

STREETS OF THE CITY

Kenneth R. Murray



"Streets of the City" was the winner of our recent competition for a transportation simulation. The program is written in Basic for the TRS-80. Disk versions for TRS-80 and Apple will soon be available from Sensational Software.

ABOUT THE GAME

Congratulations! You have been named Transportation Director of River City, Michigan. River City is a central city with a declining population which is now at 185,000 persons. Budget problems over the past decade have resulted in a severely deteriorated road system and inadequate bus service.

Prior to your being hired, the City Commission approved a ten-year transportation improvement plan that will now be your responsibility to complete. In the Street Fund, the plan calls for reconstructing 44 miles of main streets, called primaries, and 16 miles of interstate. At the same time, you have to improve significantly the overall street conditions and traffic safety. For the Transit Authority, an aging bus fleet needs to be expanded and modernized, and ridership must be expanded.

Your success will be measured in two ways. The first is how well you progress each year in meeting the overall goal. Second is your ability to maintain a majority vote of the City Commission. Each influences the other.

Kenneth R. Murray, Deputy City Manager, Grand Rapids, MI.

Goals to be Achieved

In the initialization of the simulation, the initial conditions are randomly set within reasonable limits. This includes the first budgets, street mileage and conditions, the traffic safety index, fleet size and age, and transit performance. The goals that you must achieve are as follows:

GOAL	STANDARD
Primary Street Reconstruction	Reconstruct 44 Miles
Interstate Highway Construction	Build 16 Miles
Street Condition Index	Reduce 60 Percent
Traffic Safety Index	Reduce 60 Percent
Bus Fleet Age	Reduce 60 Percent
Bus Ridership	Increase 4 Times
Fleet Downtime Index	Reduce 60 Percent
On Schedule Performance Index	Reduce 60 Percent

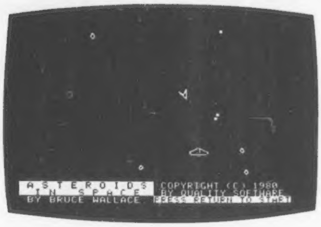
Highway Construction: The costs are initially set at random. Each year costs will increase because of inflation. An inadequate maintenance program will also cause the construction costs to rise.

Street Conditions: A street condition index is randomly set; the higher the index, the worse the condition. Each year the index is adjusted according to street mileage (total streets will be added in relation to inflationary pressures on development) and how well you budget for street maintenance. Your maintenance costs are determined by street mileage, street conditions, labor negotiations, and inflation.

Traffic Safety: A traffic safety index is also set randomly; again, the higher the index, the worse the traffic accident rate. This index is adjusted each year according to changes in the street conditions and how well you meet your maintenance and safety budget. The safety needs are determined by street mileage, the traffic safety index, labor negotiations, and inflation.

Age of Bus Fleet: The size and age of the fleet are randomly set and are incremented

Software for the Apple II and Apple II Plus*



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ASTEROIDS      COPYRIGHT (C) 1980
IN SPACE       BY QUALITY SOFTWARE
BY BRUCE WALLACE PRESS RETURN TO START
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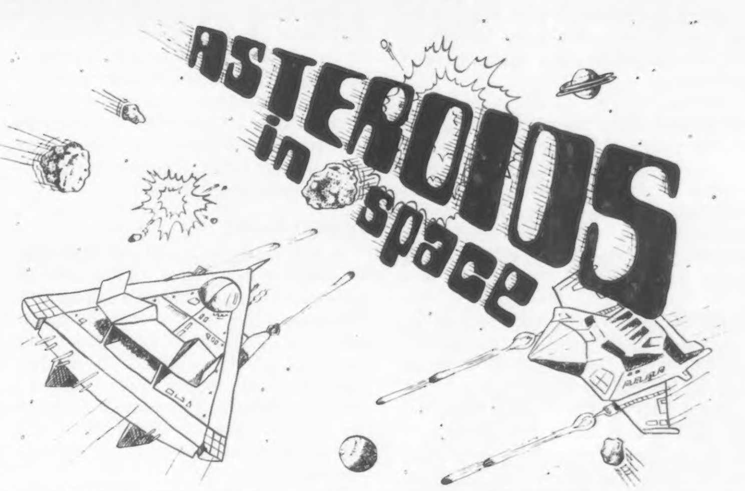
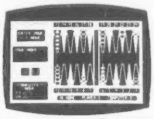


ASTEROIDS IN SPACE™
By Bruce Wallace
An exciting space action game! Your space ship is traveling in the middle of a shower of asteroids. Blast the asteroids with lasers, but beware — big asteroids fragment into small asteroids! The Apple game paddles allow you to rotate your space ship, fire its laser gun, and give it thrust to propel it through endless space. From time to time you will encounter an alien space ship whose mission is to destroy you, so you'd better destroy it first! High resolution graphics and sound effects add to the arcade like excitement that this program generates. Runs on any Apple II with at least 32K of RAM and one disk drive.

On Diskette - $19.95

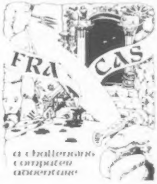


FASTGAMMON™ By Bob Christiansen.
Sound, hi res, color, and musical cartoons have helped make this the most popular backgammon playing game for the Apple II. But don't let these entertaining features fool you — FASTGAMMON plays serious backgammon. Runs on any Apple II with at least 24K of RAM.

Cassette - $19.95 Diskette - $24.95

ASTROAPPLE™ by Bob Male.
Your Apple computer becomes your astrologer, generating horoscopes and forecasts based on the computed positions of the heavenly bodies. This program offers a delightful and stimulating way to entertain friends. ASTROAPPLE produces natal horoscopes (birth charts) for each person based on his or her birth data. Any two people may be compared for physical, emotional, and intellectual compatibility. The program is written in Applesoft BASIC with machine language subroutines. It requires either RAM or ROM Applesoft and at least 32K of memory.

Cassette - $14.95 Diskette - $19.95



FRACAS™ by Stuart Smith.
A fantastic adventure game like no other! Up to eight players can participate in FRACAS at the same time. Journey in the land of FAROPH, searching for hidden treasure while warding off all sorts of unfriendly and dangerous creatures. You and your friends can compete with each other or you can join forces and gang up on the monsters. Your location is presented graphically and sound effects enliven the battles. Save your adventure on diskette or cassette and continue it at some other time. Both integer BASIC and Applesoft versions included. Requires at least 32K of RAM.

Cassette - $19.95 Diskette - $24.95

BENEATH APPLE MANOR™ by Don Worth.
Descend beneath Apple Manor into an underground maze of corridors, rooms, and secret passages in quest of rich and powerful treasures. The dungeon complex consists of many floors, each lower level more dangerous than the last. If you can reach the lowest level, you may even find the ultimate object of your quest, the fabled golden apple of Apple Manor. Strategy is extremely important as you deal with a variety of monsters, each with its own characteristics. Written in integer BASIC with machine language subroutines. Requires integer BASIC and at least 16K of RAM on cassette or 32K of RAM on diskette.

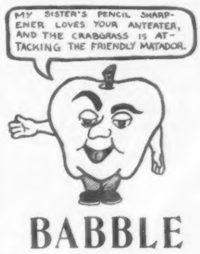
Cassette - $14.95 Diskette - $19.95

BATTLESHIP COMMANDER™ by Erik Kilk and Matthew Jew.

A game of strategy. You and the computer each start out by positioning five ships of different sizes on a ten by ten grid. Then the shooting starts. Place your volleys skillfully — a combination of logic and luck are required to beat the computer. Cartoons show the ships sinking and announce the winner. Sound effects and flashing lights also add to the enjoyment of the game. Both Applesoft and integer BASIC versions are included. Requires at least 32K of RAM.

Cassette - $14.95 Diskette - $19.95

BABBLE™ by Don Worth.
Have fun with this unique software. You write a story, entering it as a BABBLE program. As you write the story you specify certain words to be selected by the computer or entered from the keyboard at execution time. Run the program and watch BABBLE convert your story into an often hilarious collection of incongruities. The ways in which BABBLE can entertain you are limited only to your imagination. You can compose an impressive political speech or write poetry. You can plan a dinner menu. You can even form images on the screen or compose musical tunes with the help of BABBLE. The cassette version requires at least 16K of RAM and the diskette version requires at least 32K of RAM. BABBLE is written in machine language and runs on any Apple II computer.


MY SISTER'S PENCIL SHARPENER LOVES YOUR ANTEATER, AND THE CRABGRASS IS ATTACKING THE FRIENDLY MATADOR.
BABBLE

Cassette - $19.95 Diskette - $24.95

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LINKER by Don Worth.
Turn your Apple II or Apple II Plus into a powerful and productive software development machine with this superb linking loader/editor package. LINKER does the following and much more:

- Dynamically loads and relocates suitably prepared machine language programs anywhere in RAM.
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- Produces a map of all loaded routines, giving their location and the total length of the resulting module.
- Contains a library of subroutines including binary multiplication and division, print text strings, delay, tone generator, and random number generator.

Linker works with virtually any assembler for the Apple II. Requires 32K of RAM and one disk drive.

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CIRCLE 195 ON READER SERVICE CARD

City Streets, continued...

each year according to your sale and acquisition of buses. Sale is assumed on the basis of the oldest buses being sold first. Sale and purchase prices are influenced by inflation.

Ridership: Ridership is initially determined randomly. It is then affected by decisions on the number of routes, the hours of service, the days of service, and bus fare. The performance measures of downtime and on-schedule performance (referred to as service delay) and strikes will also affect ridership.

Fleet Downtime: This is measured by an index; the higher the index, the greater the downtime. The index is adjusted according to the age of the fleet and how well you meet your maintenance budget. The maintenance needs are determined by the size and age of the fleet, the level of service, labor negotiations, and inflation.

Service Delay: The higher the service delay index, the poorer is your on-schedule performance. This index is determined by the size of the fleet relative to the number of routes, downtime, and meeting your operational budget. Operating needs are affected by the number of routes, hours and days of operation, labor negotiations, and inflation. You should not let the average number of buses per route drop below three.

Transit Authority Service Decisions

In this phase you determine the level of transit service you will have for the year. Your decisions and ranges are as follows:

SERVICE	INITIAL VALUE	RANGE OF OPTIONS
Routes	6	6 to 25
Hours of Operation Per Day	12	12, 17, or 24
Days of Operation	6	6 or 7
Fare	$.35	$.25 to $1.00

capital account and vice versa. The percentage that you can shift will change according to the amount of bonds you have issued. Your operating revenue, which includes funds left over from the previous year, gasoline taxes, and tax levy, is automatically adjusted to delete bond payments. Gasoline tax revenue is initially calculated at the start of the simulation based on street mileage and vehicle miles, then adjusted according to mileage changes and inflation. It is not a variable over which you have control. The construction budget, exclusive of bonds, is similarly set.

In making your maintenance and safety decisions, you should remember that the needs shown are the minimum amounts necessary to keep the maintenance and safety indexes approximately the same.

Bonding

In years 3 and 7, you will have the option of seeking authority to borrow money (in the form of bonds) for street construction. In year 3, the bond limit is $1.5 million, and in year 7, it is $2.0 million, each per year. You do not have to request the entire amount. The City Commission will decide what size of a bond issue to put to a vote of Reducing the indexes requires more than the minimum appropriation.

Property Taxes

In this phase you will ask the City Commission to levy up to ten mills of property tax for street and transit operation. The amount that is approved will depend upon your support of the Commission and the size of the levy requested. The tax that is approved must then be divided between streets and transit. If you are too greedy, the chances that the Commission will approve a less-than-adequate property tax increase.

The amount of the property tax base is set at the start of the simulation. Each year it changes according to inflation, street improvements, and bus ridership. The theory is that with streets and more bus riders, property values will increase. Conversely, with poorer streets and fewer riders, property values will decrease.

Street Fund Budget

Once the tax levy is determined, you must decide how much to spend from the Street Fund on maintenance, safety, and construction. You will be able to transfer money from the operating account to the the citizens. The Commission decision will depend upon the size of the bond requested and your support among the Commission members. Once the issue is submitted to a vote, you will be asked to make certain pledges to the Coalition of Neighborhood Associations. Making the pledges will improve the chance of passage; however, if you fail to keep your pledges, you will be penalized severely.

Transit Budget

You have a similar set of decisions to make on the Transit Authority budget. Operating revenues include rider fare (ridership times fare), a federal subsidy which is automatically set at half of the operating and maintenance needs for the year and tax revenues. The capital budget consists of revenues from the sale of buses and from occasional federal grants. You may transfer up to 25% of the operating revenues to acquisition, but you may not use the capital fund for operations. By random determination, you may receive a federal grant for bus acquisition. In those years you cannot transfer funds from the operating account. Your decision whether to buy and/or sell buses depends upon your fleet needs. Remember that buses add to maintenance costs, whether you need them or not. A rule of thumb is that three buses are needed per route. Again, the operating and maintenance needs are minimums necessary to hold the indexes about the same.

Labor Negotiations

The final phase of decision making is labor negotiations for the next year. The outcome of the negotiations directly affects your operating and maintenance budget for streets and the Transit Authority.

There will be between two and six rounds of negotiations, with the Union making the first offer. Subsequent union offers will depend upon how willing you are to bargain in good faith. If you reach a settlement, excellent. If you do not reach a settlement, you risk a strike. The probability of a strike depends upon the beginning and ending positions of the two parties. Once a strike occurs, the wage decision is out of your hands; and it will be decided by an arbitrator according to the beginning and ending positions of the two parties and how much each has changed its position. A strike negatively affects your performance for the year in which it occurs, so you should not risk one lightly.

Performance Review

Once you have completed the decision process, you will be given a comparison of the effects of your decisions this year against the past year and against the fiscal plan. You will also be shown a graphic display of the status of your street construction. Your general performance will be evaluated and you will be told the strengths and weaknesses of your performance. Depending upon your performance, you can gain or lose support among the Commissioners. You begin the game with the unanimous support of all eleven Commissioners.

End of the Game

The game can end in one of three ways. The most desirable, and the one requiring the most political acumen, is for you to complete satisfactorily the transportation plan. The second way is to serve out the ten years but not complete the plan, which results in a demotion for you. The third ending is that you will be asked to resign. This will happen if you fail to keep the support of at least six Commissioners. And, it's easier to lose votes than it is to gain them.

Good luck on your new job! □

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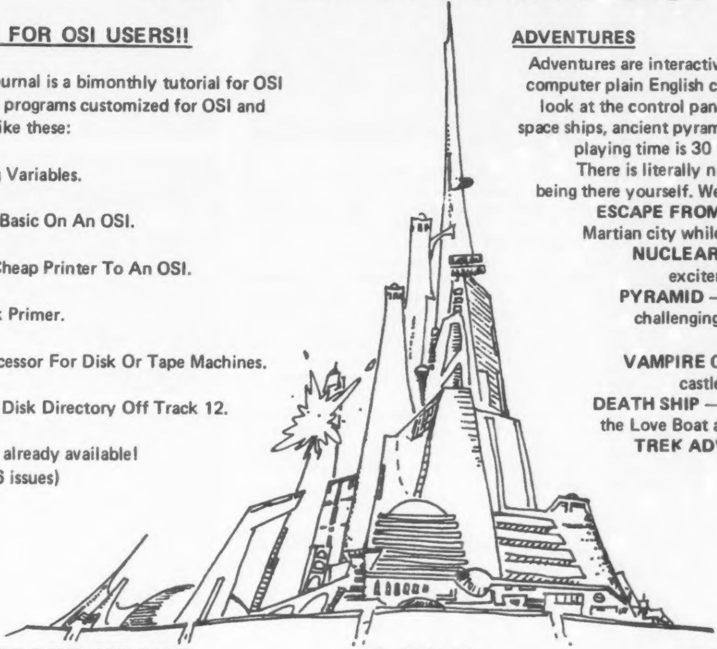

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NEW SUPPORT ROMS FOR BASIC IN ROM MACHINES

C1S — for the C1P only, this ROM adds full screen edit functions (insert, delete, change characters in a basic line.), Software selectable scroll windows, two instant screen clears (scroll window only and full screen.), software choice of OSI or standard keyboard format, Bell support, 600 Baud cassette support, and a few other features. It plugs in in place of the OSI ROM. NOTE: this ROM also supports video conversions for 24, 32, 48, or 64 characters per line. All that and it sells for a measly $39.95.

C1E/C2E for C1/C2/C4/C8 Basic in ROM machines.

This ROM adds full screen editing, software selectable scroll windows, keyboard correction (software selectable), and contains an extended machine code monitor. It has breakpoint utilities, machine code load and save, block memory move and hex dump utilities. A must for the machine code programmer replaces OSI support ROM. Specify system $59.95

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SUPER COPY — Single Disk Copier

This copy program makes multiple copies, copies track zero, and copies all the tracks that your memory can hold at one time — up to 12 tracks at a pass. It's almost as fast as dual disk copying. — $15.95

MAXIPROSS (WORD PROCESSOR) — 65D polled keyboard only - has global and line edit, right and left margin justification, imbedded margin commands, choice of single, double or triple spacing, file access capabilities and all the features of a major word processor — and it's only $39.95.

P.C. BOARDS

MEMORY BOARDS!! — for the C1P. — and they contain parallel ports!

Aardvarks new memory board supports 8K of 2114's and has provision for a PIA to give a parallel ports! It sells as a bare board for $29.95. When assembled, the board plugs into the expansion connector on the 600 board. Available now!

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ALIEN INVADERS with machine code moves — for fast action. This is our best invaders yet. The disk version is so fast that we had to add selectable speeds to make it playable.
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TIME TREK (8K) — real time Startrek action. See your torpedoes move across the screen! Real graphics — no more scrolling displays. $9.95

STARFIGHTER — a real time space war where you face cruisers, battleships and fighters using a variety of weapons. Your screen contains working instrumentation and a real time display of the alien ships. $6.95 in black and white - $7.95 in color and sound.

MINOS — A game with amazing 3D graphics. You see a maze from the top, the screen blanks, and then you are in the maze at ground level, finding your way through on foot. Realistic enough to cause claustrophobia. — $12.95

SCREEN EDITORS

These programs all allow the editing of basic lines. All assume that you are using the standard OSI video display and polled keyboard.

C1P CURSOR CONTROL — A program that uses no RAM normally available to the system. (We hid it in unused space on page 2). It provides real backspace, insert, delete and replace functions and an optional instant screen clear.
$11.95

C2/4 CURSOR. This one uses 366 BYTES of RAM to provide a full screen editor. Edit and change lines on any part of the screen. (Basic in ROM systems only.)

FOR DISK SYSTEMS — (65D, polled keyboard and standard video only.)

SUPERDISK. Contains a basic text editor with functions similar to the above programs and also contains a renumberer, variable table maker, search and new BEXEC* programs. The BEXEC* provides a directory, create, delete, and change utilities on one track and is worth having by itself. — $24.95 on 5" disk - $26.95 on 8".

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VISA

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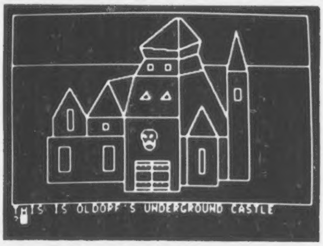
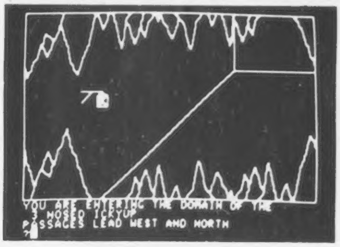
CIRCLE 102 ON READER SERVICE CARD

```
1 CLEAR 1500:DEFSTR F:DIM T$(6),T(6,11),TB(9,10),A(8,2),B(2,10),S(5,11),U(10),M(
10):C$=CHR$(207):D$=CHR$(212):E$=CHR$(255)
50 CLS:FOR X=10 TO 115:SET(X,3):NEXT
51 FOR Y=4 TO 44:SET(10,Y):SET(115,Y):NEXT
52 FOR X=10 TO 115:SET(X,44):NEXT
53 PRINT@213,"STREETS OF THE CITY";
54 PRINT@605,"BY";
55 PRINT@661,"KENNETH R. MURRAY";
56 FOR X=1 TO 1500:NEXT X
100 CLS:PRINT"CONGRATULATIONS! YOU HAVE BEEN NAMED TRANSPORTATION"
105 PRINT"DIRECTOR OF RIVER CITY, MICHIGAN, A CENTRAL CITY WITH"
110 PRINT"A DECLINING POPULATION AND WHICH HAS SUFFERED DETERIORATION"
115 PRINT"OF ITS TRANSPORTATION SERVICES OVER THE LAST SEVERAL YEARS.":PRINT
120 PRINT"PRIOR TO YOUR BEING HIRED, THE CITY COMMISSION ADOPTED"
125 PRINT"A TEN-YEAR TRANSPORTATION PLAN TO RESTORE SERVICES FOR"
130 PRINT"BOTH STREETS AND BUSES TO AN ADEQUATE LEVEL. IT WILL BE"
135 PRINT"YOUR RESPONSIBILITY TO CARRY OUT THIS PLAN.":PRINT
140 PRINT"FOR THE STREET FUND, YOU WILL NEED TO CONSTRUCT SEVERAL"
145 PRINT"MILES OF INTERSTATE HIGHWAYS AND RECONSTRUCT MAJOR LOCAL"
150 PRINT"STREETS (CALLED PRIMARIES). YOU WILL ALSO NEED TO IMPROVE"
155 PRINT"STREET CONDITIONS AND TRAFFIC SAFETY.":PRINT
814 S$(1)="RIDERSHIP":S$(2)="FLEET AGE":S$(3)="DOWNTIME":S$(4)="SERVICE DELAY":S
$(5)="FLEET SIZE"
850 T$(2)="PRIMARY ST. MILEAGE":T$(3)="INTERSTATE MILEAGE"
860 T$(4)="STREET CONDITION INDEX":T$(5)="TRAFFIC SAFETY INDEX"
865 T$(1)="LOCAL ST. MILEAGE":T$(6)="VEHICLE MILES"
1000 FA="$$######,###.":FB="######,###":FC="$$##.##"
1002 FOR R=1 TO 8
1003 FOR C=1 TO 2
1004 READ A(R,C)
1005 NEXT C
1006 NEXT R
1007 DATA 128,191,384,431,640,687,704,767,896,959
1008 DATA 15,975,31,991,47,1007
1029 YR=0:CV=11:G1=0:G3=0:B=50:P1=120000:P2=75000:M9=RND(150)*1000
1030 CI=(((RND(250)+250)*1000)+1000000)/2
1040 MI=RND(5000)+35000
1050 T(1,YR)=450+RND(100):T(2,YR)=85+RND(25):T(3,YR)=0
1060 T(4,YR)=RND(50)*.1+6:T(5,YR)=RND(50)*.1+6
1065 XX=3000+RND(3000):XY=7000+RND(3000):XZ=20000+RND(8000)
1070 T(6,YR)=(XX*T(1,YR))+(XY*T(2,YR))
1080 TB(1,YR)=(T(6,YR)/1.6)+300000:PT=TB(1,YR)*(((30+RND(20))*.01)):TB(8,YR)=TB(
1,YR)+PT:TB(2,YR)=1
1090 TB(3,YR)=(RND(500)*1000)+2100000:TB(9,YR)=TB(3,YR)
2000 MN=(T(1,YR)*MI*.16*(T(4,YR)*.1))+(T(2,YR)*MI*.5*(T(4,YR)*.1))+(T(3,YR)*MI)
2010 SN=MN*.04*T(5,YR):TB(6,YR)=MN:TB(7,YR)=SN
2011 S(1,YR)=RND(350)*1000+550000:S(5,YR)=INT(RND(10)+15):M1=INT(RND(3000)+5000)
2012 BF=0:M3=200:FOR X=1 TO S(5,YR)
2013 BF=BF+RND(12)+3
2014 NEXT X
2015 S(2,YR)=INT((BF/S(5,YR))*10)*.1:M2=(M1*S(5,YR))+(M3*BF)
2018 S=(RND(300)+500)*.01:S1=6:S2=12:S3=6:M5=(S1*S2*S3*312*S)+M9
2021 S4=.35:B(1,YR)=(RND(500)*1000)+200000
2022 S(3,YR)=INT(S(2,YR)/3)+6+(RND(50)*.1):S(4,YR)=INT(S(3,YR)/3)+6+(RND(50)*.1)
:S(1,YR)=S(1,YR)-(((S(3,YR)+S(4,YR))*.01)*S(1,YR)):BE=M5:M2=M2+(M5*.1):BD=M2
2030 T(4,11)=INT(T(4,YR)*.4):T(5,11)=INT(T(5,YR)*.4):S(1,11)=S(1,YR)*4:S(2,11)=I
NT(S(2,YR)*.4):S(3,11)=INT(S(3,YR)*.4):S(4,11)=INT(S(4,YR)*.4):T(2,11)=44+T(2,YR
):T(3,11)=16
2040 INPUT"PRESS ENTER";Z:CLS:PRINT"FOR THE TRANSIT AUTHORITY, YOU HAVE TO REPLA
CE A"
2041 PRINT"DELAPIDATED BUS FLEET, INCREASE RIDERSHIP, REDUCE THE"
2042 PRINT"MAINTENANCE DOWNTIME, AND IMPROVE ON-SCHEDULE PERFORMANCE"
2043 PRINT"(ALSO REFERRED TO AS SERVICE DELAY).":PRINT
2044 PRINT"FOR ALL INDICES USED, THE HIGHER THE INDEX VALUE THE"
2045 PRINT"WORSE THE CONDITION INDICATED.  THE BUDGET NEEDS LISTED"
2046 PRINT"ARE THE MINIMUMS NEEDED TO MAINTAIN THE INDEX AT ITS "
2047 PRINT"PRESENT LEVEL; IMPROVING THE LEVEL REQUIRES BUDGETS THAT"
2048 PRINT"ARE HIGHER THAN THE MINIMUM NEEDS.":PRINT@960,"PRESS ENTER";:INPUT Z
2049 CLS:PRINT:PRINT"YOUR GOALS FOR THE PLAN ARE AS FOLLOWS:":PRINT
2050 PRINT"STANDARD";TAB(30)"PRESENT";TAB(45)"GOAL"
2051 PRINT
2052 FOR X=2 TO 5:PRINT T$(X);TAB(30)T(X,YR);TAB(45)T(X,11):NEXT X
2053 PRINT
2054 FOR X=1 TO 4
2055 IF X=1 THEN 2058
2056 PRINT S$(X);TAB(30)S(X,YR);TAB(45)S(X,11):NEXT X
2057 GOTO 2060
2058 PRINT S$(X);TAB(30);:PRINT USING FB;S(X,YR);:PRINT TAB(45);:PRINT USING FB;
S(X,11):NEXT X
2060 PRINT:PRINT"GOOD LUCK!":PRINT@935,"PRESS ENTER";:INPUT Z
2990 YR=YR+1
2991 FOR X=1 TO 5
2992 S(X,YR)=S(X,YR-1)
```

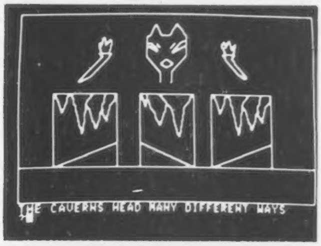
TAXI
1st L Ami$



```
THIS IS OLDORF'S UNDERGROUND CASTLE
>
```



```
YOU ARE ENTERING THE DOMAIN OF THE
 3 NOSED ICKYUP
PASSAGES LEAD WEST AND NORTH
>
```



```
THE CAVERNS HEAD MANY DIFFERENT WAYS
>
```

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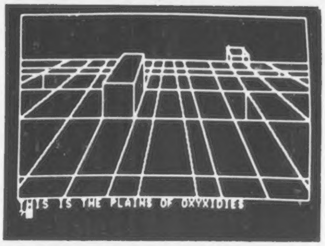
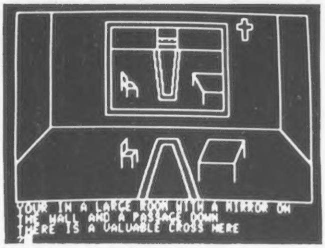
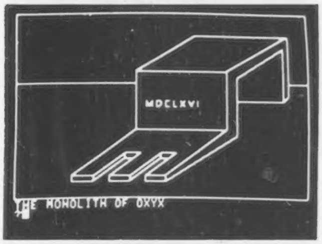


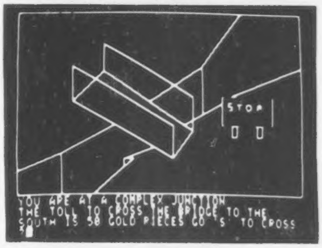
```
THIS IS THE PLAINS OF OXYXIDIES
>
```



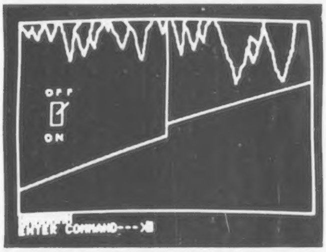
```
YOUR IN A LARGE ROOM WITH A MIRROR ON
THE WALL AND A PASSAGE DOWN
THERE IS A VALUABLE CROSS HERE
>
```



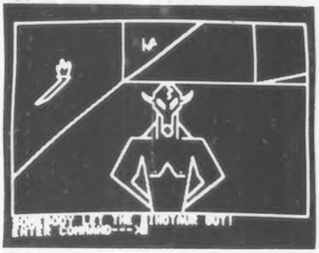
```
THE MONOLITH OF OXYX
>
```



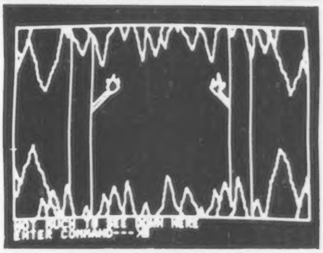
```
YOU ARE AT A COMPLEX JUNCTION
THE TOLL TO CROSS THE BRIDGE TO THE
SOUTH IS 50 GOLD PIECES GO 'S' TO CROSS
>
```



```
[illegible]
ENTER COMMAND--->
```



```
SOMEBODY LET THE MINOTAUR OUT!
ENTER COMMAND--->
```



```
NOT MUCH TO SEE DOWN HERE
ENTER COMMAND--->
```

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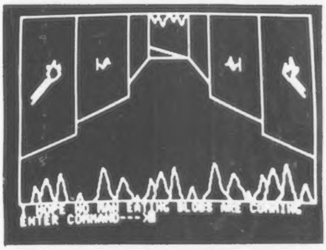
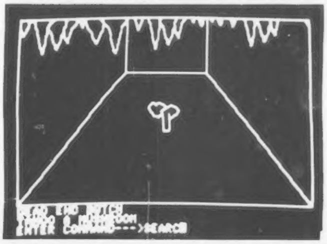
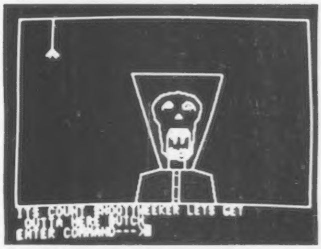


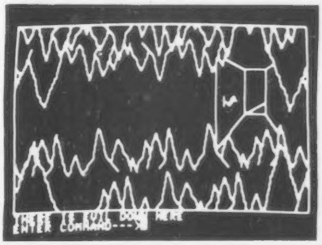
```
I HOPE NO MAN EATING BLOBS ARE COMMING
ENTER COMMAND--->
```



```
DEAD END DITCH
THERE'S A MUSHROOM
ENTER COMMAND--->SEARCH
```



```
ITS COUNT SHOOTNEEKER LETS GET
 OUTTA HERE QUICK
ENTER COMMAND--->
```



```
THERE IS EVIL DOWN HERE
ENTER COMMAND--->
```

CIRCLE 151 ON READER SERVICE CARD

City Streets, continued...

```
2993 NEXT X
3010 FOR X=1 TO 6
3020 T(X,YR)=T(X,YR-1)
3030 NEXT X
3040 FOR X=1 TO 9
3050 TB(X,YR)=TB(X,YR-1)
3051 NEXT X
3052 B(1,YR)=B(1,YR-1):B(2,YR)=B(2,YR-1)::IF RND(10)<5 THEN GG=(RND(6)*P1) ELSE
GG=0
3053 B(2,YR)=B(2,YR)+GG:IF B(2,YR)>P1*10 THEN B(2,YR)=P1*10
3065 IF YR=1 THEN 3071
3070 I=(RND(10)+5)*.01::P1=P1+(P1*I):P2=P2+(P2*I):M9=M9+(M9*I)
3071 B(1,YR)=B(1,YR-1):B(2,YR)=B(2,YR-1):IF RND(10)<5 THEN GG=RND(6)*P1 ELSE GG=
0
3072 B(2,YR)=B(2,YR)+GG:IF YR=1 THEN 3241
3080 MI=MI+(MI*I):CI=CI+(CI*I):TB(1,YR)=TB(1,YR)+(TB(1,YR)*I):IF YR>2 AND T(4,YR
)>T(4,YR-2) THEN CI=CI*1.1
3081 M1=M1+(M1*I):M3=M3+(M3*I):M2=(M1*S(5,YR))+(M3*BF)
3100 IF I>.11 THEN T(1,YR)=T(1,YR)+RND(7)
3110 IF I<=.11 AND I>.08 THEN T(1,YR)=T(1,YR)+RND(15)
3120 IF I<=.08 THEN T(1,YR)=T(1,YR)+RND(22)
3190 T(6,YR)=T(6,YR)+(XX*(T(1,YR)-T(1,YR-1)))+(XY*(T(2,YR)-T(2,YR-2)))+(XZ*(T(3,
YR)-T(3,YR-2)))
3200 TB(1,YR)=((T(6,YR))/1.6)+(TB(1,YR)*I):PT=PT+(PT*(I+.02))+(PT*(((S(5,YR)-S(5
,YR-1))/S(5,YR-1))/2))
3210 TB(3,YR)=TB(3,YR)+(TB(3,YR)*(I-.02)):S(1,YR)=S(1,YR)+(S(1,YR)*.02)
3220 TB(9,YR)=TB(9,YR)+TB(3,YR)+B1:TB(8,YR)=TB(8,YR)+TB(1,YR)
3230 MN=(T(1,YR)*MI*.16*(T(4,YR)*.1))+(T(2,YR)*MI*.5*(T(4,YR)*.1))+T(3,YR)*MI
3235 MN=(MN*.6)+((MN*.4)*(1+U*.01))
3240 SN=MN*.04*T(5,YR):SN=(SN*.6)+((SN*.4)*(1+U*.01))
3241 CLS:PRINT"YOUR TRANSIT AUTHORITY SERVICE OPTIONS ARE:":PRINT
3242 PRINT TAB(5)"1.  ROUTES":PRINT TAB(5)"2.  HOURS OF OPERATION":PRINT TAB(5)"
3.  DAYS OF SERVICE":PRINT TAB(5)"4.  FARE":PRINT TAB(5)"5.  TO CONTINUE"
3243 PRINT:INPUT"WHAT IS YOUR CHOICE";Z:IF INT(Z)<>Z AND Z<1 OR Z>5 THEN 3241
3247 ON Z GOTO 3248,3254,3262,3270,3286
3248 PRINT@640,"PRESENT NUMBER OF ROUTES=";S1
3249 PRINT@704,"NEW NUMBER OF ROUTES (MIN. OF 6, MAX. OF 25)";
3250 INPUT S1(1):PRINT@960,E$;:IF INT(S1(1))<>S1(1) THEN 3280
3251 IF S1(1)<6 THEN 3281
3252 IF S1(1)>25 THEN 3281 ELSE 3241
3254 PRINT@640,"YOUR POSSIBLE HOURS OF OPERATION ARE LISTED BELOW":IF S2=12 THEN
 S2=1
3255 IF S2=17 THEN S2=2
3256 IF S2=24 THEN S2=3
3257 PRINT@704,"CURRENT OPTION=";S2:PRINT@768,"1. 6 AM TO 6 PM":PRINT@808,"2. 6
AM TO 11 PM":PRINT@832,"3. 24 HOURS":PRINT@872,"NEW HOURS";:INPUT S2(1):PRINT@96
0,E$;:IF INT(S2(1))<>S2(1) OR S2(1)<1 OR S2(1)>3 THEN 3282
3258 IF S2(1)=1 THEN S2(1)=12
3259 IF S2(1)=2 THEN S2(1)=17
3260 IF S2(1)=3 THEN S2(1)=24
3261 GOTO 3241
3262 PRINT@640,"YOUR OPTIONS FOR DAYS OF SERVICE ARE AS FOLLOWS"
3263 IF S3=6 THEN S3=1 ELSE S3=2
3264 PRINT@704,"CURRENT OPTION=";S3:PRINT@768,"1. MONDAY THROUGH SATURDAY"
3265 PRINT@832,"2. MONDAY THROUGH SUNDAY"
3266 PRINT@872,"NEW DAYS =";:INPUT S3(1):PRINT@960,E$;
3267 IF INT(S3(1))=S3(1) AND S3(1)=1 OR S3(1)=2 THEN 3268 ELSE 3283
3268 IF S3(1)=1 THEN S3(1)=6 ELSE S3(1)=7
3269 GOTO 3241
3270 PRINT@640,"THE FARE MAY BE CHANGED IN NICKEL UNITS, WITH A"
3271 PRINT@704,"MINIMUM FARE OF $.25 AND A MAXIMUM OF $1.00"
3272 PRINT@768,"DO NOT ENTER DOLLAR SIGN"
3273 PRINT@832,"CURRENT FARE =";S4:PRINT@872,"NEW FARE =";
3274 INPUT S4$:PRINT@960,E$;:IF RIGHT$(S4$,1)="0" OR RIGHT$(S4$,1)="5" THEN 3275
 ELSE 3285
3275 S4(1)=VAL(S4$):IF S4(1)<.25 OR S4(1)>1 THEN 3284
3277 GOTO 3241
3279 GOTO 3286
3280 PRINT@960,"YOU MUST ENTER A WHOLE NUMBER";:PRINT@704,E$:GOTO 3249
3281 PRINT@960,"YOUR NUMBER IS OUTSIDE THE RANGES";:PRINT@704,E$:GOTO 3249
3282 PRINT@960,"YOUR OPTION MUST BE 1, 2, OR 3";:PRINT@832,E$:GOTO 3257
3283 PRINT@960,"YOUR OPTION MUST BE 1 OR 2";:PRINT@832,E$:GOTO 3265
3284 PRINT@960,"YOUR FARE IS OUTSIDE THE RANGE";:PRINT@832,E$:GOTO 3273
3285 PRINT@960,"THE FARE MUST BE IN NICKEL INCREMENTS";:PRINT@832,E$:GOTO 3273
3286 S6=0:IF S1(1)=0 AND S2(1)=0 AND S3(1)=0 AND S4(1)=0 THEN 3302
3287 IF S3(1)<>0 AND S3(1)-S3=5 THEN S6=S6+((RND(15000)+75000)*S1)
3288 IF S3(1)<>0  AND  S3(1)-S3=7 THEN S6=S6+((RND(25000)+90000)*S1)
3289 IF S3(1)<>0 AND  S3(1)-S3=12 THEN S6=S6+((RND(30000)+110000)*S1)
3291 IF  S3(1)<>0 AND  S3-S3(1)=5 THEN S6=S6-((RND(15000)+75000)*S1)
3292 IF S3(1)<>0 AND  S3-S3(1)=7 THEN S6=S6-((RND(25000)+90000)*S1)
3293 IF S3(1)<>0 AND  S3-S3(1)=12 THEN S6=S6-((RND(30000)+110000)*S1)
3294 IF S1(1)<>0 THEN S6=S6+(((100+RND(120))*500)*(S1(1)-S1))
3295 IF S2(1)<>0 AND S2(1)>0 THEN S6=S6+(RND(10000)+15000)*(S2(1)-S2)
3296 IF S4(1)<>0 AND S4(1)>S4 THEN S6=S6-(((S4(1)-S4)/5)*2000)
3297 IF S1(1)>0 THEN S1=S1(1)
3298 IF S2(1)>0 THEN S2=S2(1)
3299 IF S3(1)>0 THEN S3=S3(1)
3300 IF S4(1)>0 THEN S4=S4(1)
```

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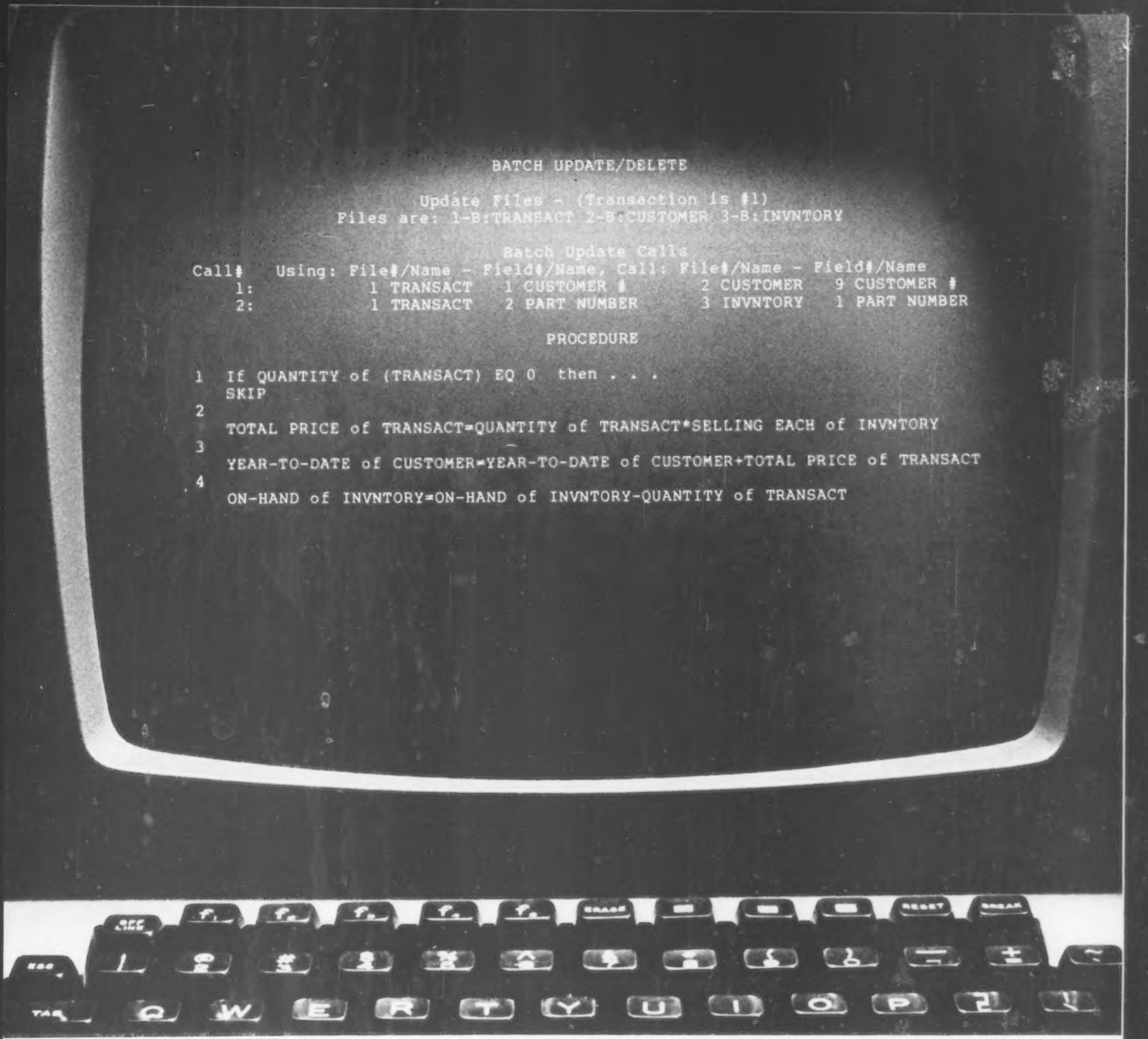
CIRCLE 184 ON READER SERVICE CARD

DONT
WALK
DONT
WALK

```
3302 S1(1)=0:S2(1)=0:S3(1)=0:S4(1)=0
3303 IF YR=3 OR YR=7 THEN 3304 ELSE 3680
3304 B9=B1:B8=DS:IF YR=3 THEN B1=1500000 ELSE B1=2000000
3309 CLS:PRINT TAB(15)"STREET FUND BOND PROPOSAL":PRINT:PRINT"YOU MAY PROPOSE BO
NDING UP TO";
3310 PRINT USING FA;B1;
3311 PRINT"SUBJECT TO"
3315 PRINT"APPROVAL OF THE CITY COMMISSION AND A VOTE OF THE"
3320 PRINT"CITIZENS.  HOW MUCH DO YOU WISH TO PROPOSE (IN"
3325 INPUT"THOUSANDS, TYPE 'O' IF NONE)";Z
3326 IF Z=0 THEN 3675
3330 Z=Z*1000:IF Z<0 OR Z>B1 THEN 3300
3331 B1=Z
3335 IF CV<8 THEN B1=B1-(RND(35)*10000)
3340 IF CV<10 THEN B1=B1-(RND(20)*10000)
3345 PRINT:PRINT"THE COMMISSION HAS APPROVED A BOND REFERENDUM"
3350 PRINT"FOR";
3355 PRINT USING FA;B1;
3356 PRINT"EACH YEAR.":PRINT:PRINT:INPUT"PRESS ENTER";Z
3360 CLS:PRINT:PRINT"THE COALITION OF NEIGHBORHOOD ASSOCIATIONS HAS ASKED"
3365 PRINT"YOU TO MAKE THE FOLLOWING PLEDGES FOR THE NEXT THREE"
3370 PRINT"YEARS.  WILL YOU MAKE ANY OF THEM (Y/N)?":PRINT
3375 IF T(4,YR)<T(4,0) THEN B2=T(4,YR)-2 ELSE B2=T(4,0)-2
3380 IF B2<1 THEN B2=1
3385 IF T(5,YR)<T(5,0) THEN B3=T(5,YR)-2 ELSE B2=T(5,0)-2
3390 IF B3<1 THEN B3=1
3395 IF G1>22 THEN B4=44-G1 ELSE B4=20
3400 IF G3>11 THEN B5=16-G3 ELSE B5=6
3405 PRINT TAB(5)"1.  IMPROVE STREET CONDITION INDEX TO";B2
3410 PRINT TAB(5)"2.  IMPROVE SAFETY INDEX TO";B3
3415 PRINT TAB(5)"3.  CONSTRUCT";B4;"MILES OF PRIMARIES"
3420 PRINT TAB(5)"4.  CONSTRUCT";B5;"MILES OF INTERSTATES"
3423 PRINT:PRINT@768,"PLEDGE 1";TAB(15)"PLEDGE 2";TAB(30)"PLEDGE 3";TAB(45)"PLED
GE 4"
3424 PRINT@832,C$
3425 PRINT@832,;
3426 INPUT Z$
3430 IF Z$<>"Y" AND Z$<>"N" THEN 3405
3435 IF Z$="N" THEN B2=0
3439 PRINT@847,C$
3440 PRINT@847,;
3441 INPUT Z$
3445 IF Z$<>"Y" AND Z$<>"N" THEN 3410
3450 IF Z$="N" THEN B3=0
3454 PRINT@862,C$
3455 PRINT@862,;:INPUT Z$
3460 IF Z$<>"Y" AND Z$<>"N" THEN 3415
3465 IF Z$="N" THEN B4=0
3469 PRINT@877,C$
3470 PRINT@877,;:INPUT Z$
3475 IF Z$<>"Y" AND Z$<>"N" THEN 3420
3480 IF Z$="N" THEN B5=0
3485 PRINT@960,"PRESS ENTER FOR ELECTION RESULTS";
3490 INPUT Z:CLS:PRINT TAB(18)"BOND ELECTION RESULTS"
3492 PRINT:PRINT"WARD";TAB(10)"YES";TAB(20)"NO";TAB(35)"TOT. YES";TAB(50)"TOT. N
O"
3495 PRINT:V5=0:V6=0
3500 IF CV>9 THEN V1=5000 ELSE V1=4000
3505 IF T(4,YR)<T(4,YR-1) AND T(4,YR)<T(4,0) THEN V1=V1+500
3510 IF T(5,YR)<T(5,YR-1) AND T(5,YR)<T(5,0) THEN V1=V1+500
3515 IF YR=7 THEN 3530
3520 IF B1<1100000 THEN V1=V1+500
3525 GOTO 3535
3530 IF B1<1600000 THEN V1=V1+500
3535 IF B2>0 THEN V1=V1+500
3540 IF B3>0 THEN V1=V1+500
3545 IF B4>0 THEN V1=V1+500
3550 IF B4>0 THEN V1=V1+500
3555 V2=RND(5)
3560 FOR X=1 TO 5
3565 IF X=V2 THEN 3585
3575 V3=V1+RND(11000)
3580 GOTO 3590
3585 V3=(V1/2)+RND(12000)
3586 IF V3<3000 THEN V3=4000
3590 V4=21000-V3:V5=V5+V3:V6=V6+V4
3595 PRINT TAB(2)X;TAB(9)V3;TAB(19)V4;TAB(35)V5;TAB(50)V6
3600 FOR Y=1 TO 500:NEXT Y
3605 NEXT X
3610 IF V5<=V6 THEN 3650
3615 PRINT:PRINT"CONGRATULATIONS.  THE BOND ISSUE WAS APPROVED BY"
3620 PRINT"THE VOTERS.  YOUR ANNUAL DEBT PAYMENT WILL BE";:DS=PT*.35
3630 PRINT USING FA;DS
3635 TB(9,YR)=TB(9,YR)+B1:B=B-10:DS=DS+B8:B1=B1+B9
3640 INPUT"PRESS ENTER";Z:GOTO 3680
3650 PRINT"THE REFERENDUM HAS FAILED."
3651 IF V6/(V5+V6)<(55+RND(15))*.01 THEN 3660
3652 PRINT"BECAUSE OF THE MARGIN OF DEFEAT, YOU HAVE LOST"
```

SPEED
LIMIT
55
STOP
SPEED LIMIT
15
WHEN
FLASHI



```
                    BATCH UPDATE/DELETE

              Update Files - (Transaction is #1)
         Files are: 1-B:TRANSACT 2-B:CUSTOMER 3-B:INVNTORY

                       Batch Update Calls
Call#   Using: File#/Name - Field#/Name, Call: File#/Name - Field#/Name
    1:           1 TRANSACT   1 CUSTOMER #         2 CUSTOMER   9 CUSTOMER #
    2:           1 TRANSACT   2 PART NUMBER        3 INVNTORY   1 PART NUMBER

                            PROCEDURE

1  If QUANTITY of (TRANSACT) EQ 0  then . . .
   SKIP
2
   TOTAL PRICE of TRANSACT=QUANTITY of TRANSACT*SELLING EACH of INVNTORY
3
   YEAR-TO-DATE of CUSTOMER=YEAR-TO-DATE of CUSTOMER+TOTAL PRICE of TRANSACT
4
   ON-HAND of INVNTORY=ON-HAND of INVNTORY-QUANTITY of TRANSACT
```

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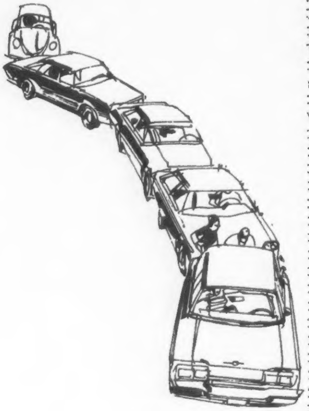

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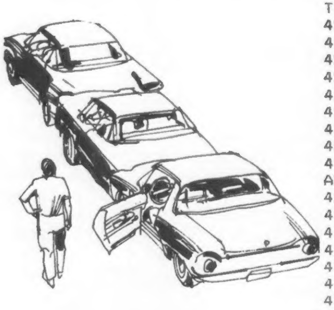

```
3653 PRINT"THE VOTE OF A COMMISSIONER.": CV=CV-1
3655 IF CV<6 THEN 6770
3660 B1=B9:B2=0:B3=0:B4=0:B5=0
3675 PRINT:INPUT"PRESS ENTER";Z
3680 CLS:PRINT TAB(18)"PROPERTY TAX LEVY"
3681 M5=(S1*S2*S3*312*S)+M9:M2=M2+(M5*.1):B(1,YR)=B(1,YR)+(S4*S(1,YR))+((M2+M5)/
2)
3685 PRINT TAB(30)"STREET FUND";TAB(45)"TRANSIT AUTHORITY"
3690 PRINT"OPERATING NEEDS";TAB(30);:PRINT USING FA;MN+SN+DS;:PRINT TAB(45);:PRI
NT USING FA;M2+M5
3695 PRINT"NON-TAX REVENUE";TAB(30);:PRINT USING FA;TB(8,YR);:PRINT TAB(45);:PRI
NT USING FA;B(1,YR)
3699 IF M2+M5-B(1,YR)<0 THEN X1=0 ELSE X1=M2+M5-B(1,YR)
3700 PRINT"PROPERTY TAX NEEDED (MILLS)";:PRINT TAB(30);:PRINT USING FA;MN+SN+DS-
TB(8,YR);:PRINT TAB(45);:PRINT USING FA;X1
3705 TN=INT(((MN+SN+DS+X1-TB(8,YR))/PT)*10)*.1:PRINT:PRINT"YIELD OF ONE MILL =";
:PRINT USING FA;PT:PRINT "TOTAL PROPERTY TAX NEEDED (IN MILLS) =";TN
3710 PRINT@640,"WHAT PROPERTY TAX LEVY (0-10 MILLS) DO YOU PROPOSE";:INPUT TB(2,
YR):PRINT@960,E$;
3715 IF TB(2,YR)>=0 AND TB(2,YR)<=10 THEN 3725
3720 PRINT@960,"YOU CANNOT EXCEED THE LIMITS";:PRINT@640,E$:GOTO 3710
3725 IF TB(2,YR)<=TB(2,YR-1) THEN 3805
3770 X1=0:X2=0
3775 FOR X=1 TO 11
3780 IF CV>9 THEN 3783
3781 IF X<=CV THEN X3=RND(5) ELSE X3=RND(8)
3782 GOTO 3785
3783 IF X<=2 THEN X3=RND(4)
3784 IF X>2 AND X<=CV THEN X3=RND(5):IF X>CV THEN X3=RND(8)
3785 IF X3<=3 THEN X1=X1+1 ELSE X2=X2+1
3790 NEXT X
3795 IF X1>=6 THEN 3801
3800 IF TB(2,YR)<=TN THEN TB(2,YR)=TB(2,YR) ELSE TB(2,YR)=TB(2,YR)-(.1*(X2+1))
3801 IF X1>=6 THEN 3805:IF TB(2,YR)>=TN+2 AND X1<10 THEN TB(2,YR)=TB(2,YR)-(2*(X
2+1))
3805 PRINT@704,"THE CITY COMMISSION HAS APPROVED A LEVY OF";TB(2,YR);"MILLS"
3810 PRINT@768,"HOW MANY MILLS ARE FOR THE STREET FUND";:INPUT T8:PRINT@960,E$;
3815 IF T8<=TB(2,YR) THEN 3825
3820 PRINT@960,"YOU CANNOT ALLOCATE MORE THAN YOU ARE AUTHORIZED";:PRINT@768,E$:
GOTO 3810
3825 TB(8,YR)=TB(8,YR)+(PT*T8)-DS:B(1,YR)=B(1,YR)+(PT*(TB(2,YR)-T8))
4000 CLS:C=0:GOTO 4020
4010 C=1
4020 CLS:PRINT TAB(10)"STREET FUND BUDGET DECISIONS FOR YEAR";YR
4030 PRINT"OPERATIONS:";TAB(33)"CONSTRUCTION:"
4040 PRINT TAB(5)"AVAILABLE:";
4041 PRINT USING FA;TB(8,YR);
4050 PRINT TAB(38)"AVAILABLE:";:PRINT USING FA;TB(9,YR)
4060 PRINT TAB(5)"MAINT. NEED=";:PRINT USING FA;MN;
4070 PRINT TAB(38)"COST PER HALF MILE UNIT:"
4080 PRINT TAB(5)"SAFETY NEED=";:PRINT USING FA;SN;
4090 PRINT TAB(38)"PRIMARY RDS.=";:PRINT USING FA;CI*.2
4100 PRINT TAB(38)"INTERSTATES=";:PRINT USING FA;CI
4110 PRINT:IF C=1 THEN 4260
4150 PRINT"YOU MAY TRANSFER UP TO ";B;"% FROM AN ACCOUNT"
4160 PRINT TAB(10)"1.  OPERATIONS TO CONSTRUCTION"
4170 PRINT TAB(10)"2.  CONSTRUCTION TO OPERATIONS"
4180 PRINT TAB(10)"3.  NO TRANSFER"
4190 INPUT Z:IF Z<>1 AND Z<>2 AND Z<>3 THEN 4020
4195 IF Z=3 THEN 4010 ELSE 4200
4200 INPUT"HOW MUCH DO YOU WANT TO TRANSFER (IN THOUSANDS, WITHOUT $ SIGN)";T:T=
T*1000
4210 IF Z=1 AND T>TB(8,YR)/(B*.01) THEN 4200
4220 IF Z=2 AND T>TB(9,YR)/(B*.01) THEN 4200
4230 IF Z=2 THEN 4250
4240 TB(8,YR)=TB(8,YR)-T:TB(9,YR)=TB(9,YR)+T:GOTO 4010
4250 TB(8,YR)=TB(8,YR)+T:TB(9,YR)=TB(9,YR)-T:GOTO 4010
4260 PRINT"ENTER CONSTRUCTION BY THE NUMBER OF HALF MILE UNITS;"
4265 PRINT"ENTER MAINTENANCE AND SAFETY BY THOUSAND DOLLAR UNITS."
4270 PRINT"DO NOT USE COMMAS OR DOLLAR SIGNS"
4280 PRINT:PRINT TAB(10)"PRIMARIES";TAB(20);"INTERSTATES";TAB(36)"MAINTENANCE";T
AB(53)"SAFETY"
4290 PRINT"LAST YR";TAB(13)PC;TAB(23)IC;
4300 PRINT TAB(35);
4301 PRINT USING FA;TB(6,YR-1);
4305 PRINT TAB(50);
4306 PRINT USING FA;TB(7,YR-1)
4310 PRINT"THIS YR";
4315 PRINT@844,;
4316 INPUT PC
4317 PRINT@960,E$;
4318 IF INT(PC)<>PC THEN 4390
4319 IF G1+(PC/2)>44 THEN 4392
4320 PRINT@854,;
4321 INPUT IC
4322 PRINT@960,E$;
4323 IF INT(IC)<>IC THEN 4393
4324 IF T(3,YR)+(IC/2)>16 THEN 4395
```

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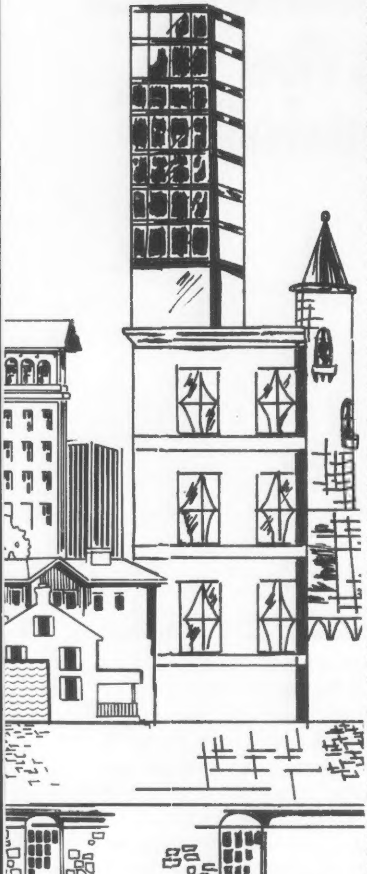

```
4325 IF (PC*(CI*.2))+(IC*CI)>TB(9,YR) THEN 4397
4326 PRINT@870,;
4327 INPUT T1:T1=T1*1000:PRINT@960,E$;:IF LEN(STR$(T1))>LEN(STR$(MN))+1 OR T1<10
0000 THEN GOSUB 4399 ELSE 4330
4328 IF Z$="Y" THEN 4330
4329 Z$="Y":PRINT@870,D$:GOTO 4326
4330 PRINT@885,;:INPUT T2:PRINT@960,E$;:T2=T2*1000:IF LEN(STR$(T2))>LEN(STR$(SN)
)+1 OR T2<100000 THEN GOSUB 4399 ELSE 4334
4331 IF Z$="Y" THEN 4334
4332 Z$="Y":PRINT@855,D$:GOTO 4330
4334 IF T1+T2>TB(8,YR) THEN 4405
4335 GOTO 4440
4390 PRINT@960,"YOU MUST ENTER A WHOLE NUMBER.";
4391 PRINT@841,C$:GOTO 4315
4392 PRINT@960,"YOU CANNOT BUILD THAT MANY MORE UNITS";:GOTO 4391
4393 PRINT@960,"YOU MUST ENTER A WHOLE NUMBER.";
4394 PRINT@851,C$:GOTO 4320
4395 PRINT@960,"YOU CANNOT BUILD THAT MANY MORE UNITS";:GOTO 4394
4397 PRINT@960,"YOUR CONSTRUCTION PROGRAM EXCEEDS YOUR BUDGET.";
4398 PRINT@841,C$:PRINT@851,C$:GOTO 4315
4399 PRINT@960,E$;:PRINT@960,"ARE YOU SURE (Y/N)";
4400 INPUT Z$:IF Z$<>"Y" AND Z$<>"N" THEN 4399
4401 RETURN:END
4402 PRINT@960,E$;:PRINT@960,"ARE YOU SURE (Y/N)";
4403 INPUT Z$:IF Z$<>"Y" AND Z$<>"N" THEN 4402:IF Z$="Y" THEN 4332
4404 PRINT@885,D$:GOTO 4330
4405 PRINT@960,"YOUR MAINTENANCE AND SAFETY BUDGET EXCEEDS YOUR FUNDS";
4406 PRINT@870,D$:PRINT@885,D$:GOTO 4326
4440 TB(6,YR)=T1:TB(7,YR)=T2
4445 T(2,YR)=T(2,YR)+PC/2:T(3,YR)=T(3,YR)+IC/2
4450 TB(8,YR)=TB(8,YR)-TB(6,YR)-TB(7,YR)
4460 TB(9,YR)=TB(9,YR)-(PC*CI*.2)-(IC*CI)
4470 PRINT@960,"PRESS ENTER";:INPUT Z
5200 T(4,YR)=T(4,YR)-(INT(((TB(6,YR)-MN)/MN)*18)*.1)
5210 IF T(4,YR)<1 THEN T(4,YR)=1
5240 T(5,YR)=T(5,YR)-(INT(((TB(7,YR)-SN)/SN)*18)*.1)
5249 IF T(4,YR)>T(4,YR-1) THEN T(5,YR)=T(5,YR)+.2
5250 IF T(5,YR)<1 THEN T(5,YR)=1
6000 CLS:C=0:GOTO 6020
6010 C=1
6020 CLS:PRINT TAB(15)"TRANSIT BUDGET FOR YEAR";YR
6030 PRINT"OPERATIONS";TAB(33)"BUS FLEET"
6040 PRINT TAB(5)"AVAILABLE";:PRINT USING FA;B(1,YR);:PRINT TAB(38)"AVAILABLE";:
PRINT USING FA;B(2,YR)
6080 PRINT TAB(5)"MAINT. NEED=";:PRINT USING FA;M2;:PRINT TAB(38)"(COST PER BUS)
:"
6090 PRINT TAB(5)"OPERATIONS NEED=";:PRINT USING FA:M5;:PRINT TAB(38)"ACQUISITIO
N=";:PRINT USING FA;P1
6100 PRINT TAB(38)"SALE=";:PRINT USING FA;P2
6110 IF C=1 THEN 6340
6120 IF GG>0 THEN PRINT@640,"BECAUSE OF THE FEDERAL GRANT, YOU CANNOT TRANSFER F
ROM":PRINT@704,"OPERATIONS TO THE BUS FLEET":FOR X=1 TO 750:NEXT X:GOTO 6200
6140 PRINT@640,"YOU MAY TRANSFER UP TO 25% FROM OPERATIONS TO ACQUISITION":PRINT
@960,E$;
6150 PRINT@704,"HOW MUCH DO YOU WISH TO TRANSFER (ENTER AMTS. IN THOUSANDS WITHO
UT $ SIGN)";:INPUT Z:Z=Z*1000:IF Z<0 OR Z>B(1,YR)/4 THEN 6180 ELSE 6190
6180 PRINT@640,E$:PRINT@704,E$:GOTO 6140
6190 B(2,YR)=B(2,YR)+Z:B(1,YR)=B(1,YR)-Z
6200 PRINT@640,E$:PRINT@704,E$
6210 PRINT@640,"HOW MANY BUSES DO YOU WISH TO SELL";:INPUT NB:IF NB>S(5,YR) OR N
B<0 OR INT(NB)<>NB THEN 6230 ELSE 6240
6230 PRINT@640,E$:GOTO 6210
6240 IF NB=0 THEN 6010
6250 BF=BF-((S(2,YR)*2)*NB):S(5,YR)=S(5,YR)-NB:M2=(M1*S(5,YR))+(M3*BF)
6331 B(2,YR)=B(2,YR)+(NB*P2):GOTO 6010
6340 PRINT:PRINT"ENTER BUDGETS IN THOUSAND DOLLAR UNITS. DO NOT"
6350 PRINT"USE COMMAS OR DOLLAR SIGNS"
6360 PRINT:PRINT TAB(22)"MAINTENANCE";TAB(36)"OPERATIONS";TAB(50)"NEW BUSES"
6370 PRINT"LAST YEAR";TAB(20);:PRINT USING FA;BD;:PRINT TAB(35);:PRINT USING FA;
BE;:PRINT TAB(53);BN
6375 PRINT"THIS YEAR";
6400 PRINT@793,;:INPUT BD:PRINT@960,E$;:BD=BD*1000
6401 IF BD<0 THEN GOSUB 6690
6402 IF BD<0 THEN 6400
6403 IF BD<100000 THEN GOSUB 4399 ELSE 6410
6404 IF Z$="Y" THEN 6410
6405 Z$="Y":PRINT@841,D$:GOTO 6400
6410 IF LEN(STR$(BD))>LEN(STR$(M2))+1 THEN 6600
6420 PRINT@806,;:INPUT BE:PRINT@960,E$;:BE=BE*1000
6421 IF BE<0 GOSUB 6690
6422 IF BE<0 THEN 6420
6423 IF BE<100000 GOSUB 4399 ELSE 6430
6424 IF Z$="Y" THEN 6430
6425 PRINT@841,D$:GOTO 6420
6430 IF LEN(STR$(BE))>LEN(STR$(M5))+1 THEN 6630
6440 IF BD+BE>B(1,YR) THEN 6660
6450 PRINT@820,;:INPUT BN:PRINT@960,E$;
6460 IF BN>100-S(5,YR) THEN 6680
```

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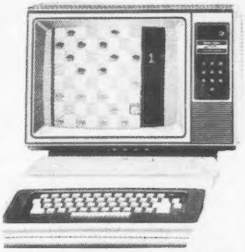

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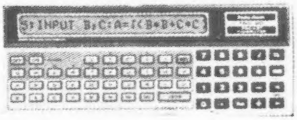

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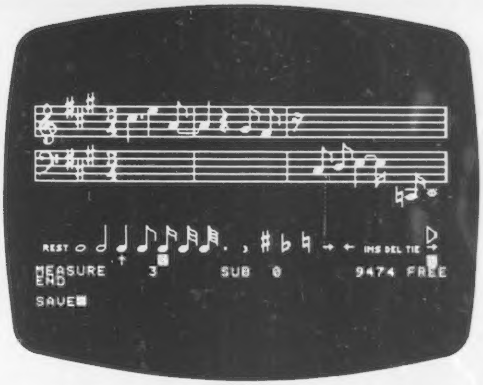
```
6470 IF BN<0 THEN GOSUB 6690
6471 IF BN>=0 THEN 6480
6472 PRINT@820,C$:GOTO 6450
6475 IF INT(BN)<>BN THEN 6710
6480 IF BN*P1>B(2,YR) THEN 6700
6490 B(2,YR)=B(2,YR)-(P1*BN):S(5,YR)=S(5,YR)+BN:BF=BF-BN
6500 BF=BF+S(5,YR):S(2,YR)=INT((BF/S(5,YR))*10)*.1
6580 B(1,YR)=B(1,YR)-(BD+BE)
6599 GOTO 6750
6600 PRINT@960,"ARE YOU SURE (Y/N)";:INPUT Z$
6610 IF Z$<>"Y" AND Z$<>"N" THEN 6600:IF Z$="Y" THEN 6420
6620 PRINT@792,D$:GOTO 6400
6630 PRINT@960,"ARE YOU SURE (Y/N)";:INPUT Z$
6640 IF Z$<>"Y" AND Z$<>"N" THEN 6630: IF Z$="Y" THEN 6440
6650 PRINT@806,D$:GOTO 6420
6660 PRINT@960,"YOUR OPERATING AND MAINTENANCE BUDGETS EXCEED YOUR FUNDS";:PRINT
@792,D$:PRINT@806,D$:GOTO 6400
6680 PRINT@960,"YOU CAN PURCHASE ONLY";100-S(5,YR);"BUSES";:GOTO 6450
6690 PRINT@960,"YOU CANNOT ENTER A NEGATIVE NUMBER";:RETURN:END
6700 PRINT@960,"YOUR PROPOSED ACQUISITION EXCEEDS YOUR BUDGET";:PRINT@820,C$:GOT
O 6450
6710 PRINT@960,"YOU MUST ENTER A WHOLE NUMBER";:PRINT@820,C$:GOTO 6450
6750 S(3,YR)=S(3,YR)-(INT(((BD-M2)/M2)*18)*.1):IF S(2,YR)>S(2,YR-1) THEN S(3,YR)
=S(3,YR)+.2
6751 IF S(3,YR)<1 THEN S(3,YR)=1
6755 S(4,YR)=S(4,YR)-(INT(((BE-M5)/M5)*18)*.1):IF S(3;YR)>S(3,YR-1) THEN S(3,YR)
=S(3,YR)+.2
6756 IF S(5,YR)/S1<3 THEN S(4,YR)=S(4,YR)+.2
6757 IF S(4,YR)<1 THEN S(4,YR)=1
6760 S(1,YR)=(S(1,YR)+S6)-((S(3,YR)+S(4,YR)-S(3,YR-1)-S(4,YR-1))*S(1,YR)*.01)
10030 REM SALARY NEGOTIATIONS
10040 NR=RND(4)+2:I=I*100:IF I=0 THEN U(1)=INT(RND(8)+8) ELSE U(1)=INT(RND(I)+8)
10060 CLS:LS=0
10070 PRINT"YOUR PRESENT WAGE IS";S;"DOLLARS PER HOUR"
10110 PRINT"THE UNION'S INITIAL OFFER IS FOR A";U(1);"PERCENT INCREASE"
10120 INPUT"WHAT IS YOUR RESPONSE";M(1)
10130 CLS
10140 PRINT"PRESENT SALARY=$";S
10160 PRINT:PRINT"UNION","MANAGEMENT"
10170 PRINT"POSITION","POSITION"
10180 PRINT
10190 PRINT U(1),M(1)
10200 FOR X=2 TO NR
10210 IF X<>NR THEN 10240
10220 PRINT"THIS IS THE LAST ROUND OF NEGOTIATIONS.  FAILURE"
10230 PRINT"TO SETTLE COULD RESULT IN A STRIKE"
10240 UO=U(X-1)-M(X-1):IF UO=0 THEN 10250 ELSE 10270
10250 U(X)=M(X-1):U=U(X)
10260 GOTO 10440
10270 IF M(X-1)-M(X-2)>=5 THEN R3=1
10280 IF M(X-1)-M(X-2)<5 THEN R3=2
10290 IF M(X-1)-M(X-2)<3 THEN R3=3
10300 IF M(X-1)-M(X-2)<1 THEN R3=4
10310 IF UO>5 THEN U(X)=U(X-1)-((RND(40)*.1)/R3)
10320 IF UO>10 OR UO<5 THEN U(X)=U(X-1)-((RND(60)*.1)/R3)
10330 IF UO>15 THEN U(X)=U(X-1)-((RND(80)*.1)/R3)
10340 IF UO>20 THEN U(X)=U(X-1)-((RND(100)*.1)/R3)
10345 IF U(X)>=U(X-1) THEN U(X)=U(X-1)-.5
10350 IF U(X)<=M(X-1) THEN U(X)=M(X-1)
10360 U(X)=INT(U(X)*100)*.01
10370 U=U(X)
10380 PRINT U(X),
10390 IF U(X)=M(X-1) THEN 10440
10400 INPUT M(X)
10410 IF M(X)=>U(X) THEN 10440
10420 NEXT X
10430 IF M(NR)<>U(NR) THEN 10490
10440 S=INT(S*(100+U))*.01
10450 PRINT"YOU HAVE REACHED AGREEMENT ON A ";U;"PERCENT"
10460 PRINT"WAGE INCREASE.  YOUR HOURLY WAGE RATE IS NOW $";S
10480 GOTO 10640
10490 IF (U(NR)-M(NR))*RND(0)>.5 THEN 10502
10500 U(NR)=M(NR):U=U(NR)
10501 GOTO 10440
10502 CLS:PRINT CHR$(23):FOR X=40 TO 80:SET(X,6):NEXT:FOR Y=7 TO 32:SET(40,Y):SE
T(80,Y):NEXT:FOR X=40 TO 80:SET(X,32):NEXT:FOR Y=33 TO 45:SET(60,Y):NEXT
10503 PRINT@216,"WORKERS";:PRINT@282,"LOCAL";:PRINT@346,"10200";
10504 FOR X=1 TO 3:PRINT@540,"ON";:PRINT@600,"STRIKE";:FOR X1=1 TO 300:NEXT X1:I
F X=3 THEN 10530
10505 PRINT@540,CHR$(194);:PRINT@600,CHR$(198);:FOR X1=1 TO 300:NEXT X1:NEXT X
10530 FOR X=1 TO 500:NEXT:M(7)=M(NR)-M(1):U(7)=U(1)-U(NR):DP=U(NR)-M(NR)
10540 IF M(7)>U(7) THEN SS(1)=(DP*(RND(6)*.1)) ELSE SS(1)=(DP*((RND(6)+3)*.1))
10550 SS(2)=M(NR)+SS(1):U=INT(SS(2)*100)*.01
10560 LS=RND(5)+RND(DP+1)
10590 CLS:PRINT"THE STRIKE LASTED FOR";LS;"DAYS.  THE ARBITRATOR"
10600 PRINT"HAS ORDERED A SETTLEMENT OF";U;" PERCENT."
10610 PRINT"THIS RESULTS IN A WAGE OF";
10620 S=INT(S*(100+U))*.01:PRINT USING FC;S
```

ALF/Apple Music Synthesizer



With the ALF software, entry of music is easy, fast and accurate.

The ALF Apple Music Synthesizer (AMS) is an easy to use peripheral which allows you to program music into an Apple II computer using standard musical notation. The ALF kit includes the synthesizer board (plugs into any peripheral slot), exceptional quality software, and an extensive user manual.

Sophisticated Music Entry Program

Sheet music is easily entered using the Apple game paddles. The high-resolution ENTRY program features the familiar music staff with a "menu" of musical items listed beneath it (note lengths, rests, edit commands, accidentals, etc.). One game paddle moves a cursor up and down the music staff and is used to select the note pitch; the second paddle chooses from the menu items (note length, etc.) With the ALF hi-res ENTRY program, you won't have to use cryptic codes to select note parameters.

As you program sheet music with ENTRY, measure bars are inserted automatically (and note values are tied over the bar where necessary). Key signatures are also automatic—you don't have to keep writing in every sharp or flat!

Three monophonic, individual parts can be programmed with each ALF Music Synthesizer. Two boards are required for stereo. A total of three synthesizers can be used simultaneously for a maximum of nine voices. By controling the envelope (or shape) of each voice, many different instrumental sounds can be simulated.

Eight-octave Range

The ALF Music Synthesizer has a pitch range of eight octaves—a wider range than a grand piano. The ALF can also play semitones—"blues notes" or the pitches in between the keyboard notes of a piano. (The pitch range is from 27.5 to 55,000 Hertz, well beyond the limits of human hearing.) Tuning accurancy is virtually perfect within two cents of pitch value.

Every parameter of the ENTRY program can be changed again and again during a musical piece. For example, you can make changes in key, time signature, volume, and timbre (envelope). Parts can be edited at any time, also. Notes can be added or deleted, note length can be changed, as well as pitch, volume, etc.

You can save songs on either cassette or disk, and play them back using either ENTRY or PLAY. The playback speed is adjusted with one of the game paddles, and can be varied during the playback, if you wish to change the overall tempo.

Colorful Playback Display

The ALF Music Synthesizer features a 16-color low-res graphic display during song playback. Each musical part is represented on a stylized piano "keyboard"—the intensity of the note determines the color, and the pitch is shown in relation to "middle C".

The ALF Music Synthesizer requires the use of an external audio amplifier. Stereo programming is possible with the use of two or three synthesizer boards.

The ALF software includes the ENTRY and PLAY programs, sample songs, an introduction to "envelope shaping", and demonstrations of advanced uses of the synthesizer.

Nine Voices for only $198

The new ALF "AM-II" music synthesizer offers an unbeatable value for the Apple owner who is a music hobbyist. With nine voices on a single music board for $198.00, the AM-II is the most economical device for creating music with the Apple.

The AM-II uses the same excellent ENTRY and PLAY programs as the more sophisticated ALF Music Synthesizer (AMS); the same hi-res graphic display from which notes are selected with the Apple game paddles (not typed with cryptic codes). All of the conveniences of the ENTRY program apply—easy editing, playback with low-res display, ability to save songs on cassette or disk, etc.

The AM-II has **stereo output** (3 voices in left, 3 voices in the middle, 3 voices in the right).

How can the AM-II offer so much for only $198.00? The two basic differences between the AM-II and the ALF Apple Music Synthesizer (AMS) are pitch accuracy and dynamic range. The AM-II has an accurate pitch range of about six octaves. Pitch values above the treble staff become increasingly inaccurate. Also, the AM-II has a dynamic range of 28db, with 16 different volume levels, (the AMS has a dynamic range of 78db).

The AM-II is manufactured with the same high quality standards as other products from the ALF Corporation. No sacrifice has been made in reliability; the new AM-II is simply a great bargain.

Professional musicians will still want to use the original Apple Music Synthesizer (AMS) for its extended range and volume controls (the AMS has a range of 8 octaves). But for the Apple owner who is interested in music as a hobby, the AM-II is the best music peripheral value available today.

Requires: 16K Apple II or Apple II Plus, cassette or Disk II, and an external audio amplifier (all necessary patch cords are included).

AM-II ALF/Apple Synthesizer	$198.00
AMS ALF/Apple Synthesizer	268.00

To order, send payment plus $3.00 shipping and handling to Peripherals Plus, 119 Maple Ave., Morristown, NJ 07960. Credit card customers should include card number and expiration date of Visa, MasterCard or American Express. Credit card customers may also order toll-free:

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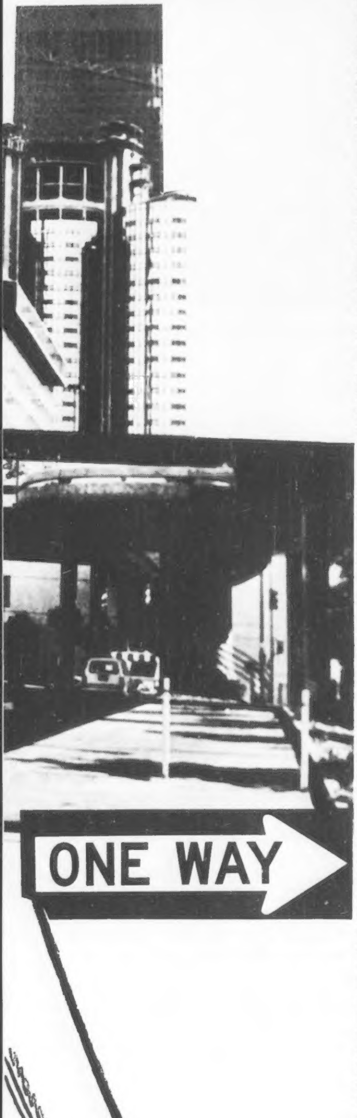

```
10621 PRINT"AS A RESULT OF THE STRIKE,":PRINT
10623 GOSUB 10634
10624 T(4,YR)=T(4,YR)+X1:PRINT TAB(5) T$(4);" HAS INCREASED BY";X1
10625 GOSUB 10634
10626 T(5,YR)=T(5,YR)+X1:PRINT TAB(5)T$(5);" HAS INCREASED BY";X1
10627 IF PC<2 THEN 10630:IF LS>=7 THE PC=PC-2 ELSE GOTO 10629
10628 PRINT TAB(5)"CONSTRUCTION PROGRAM LOST ONE MILE":GOTO 10630
10629 PC=PC-1:PRINT TAB(5)"CONSTRUCTION PROGRAM LOST 1/2 MILE"
10630 PRINT:GOSUB 10634:S(3,YR)=S(3,YR)+X1:PRINT TAB(5) S$(3);" HAS INCREASED BY
";X1
10631 GOSUB 10634:S(4,YR)=S(4,YR)+X1:PRINT TAB(5)S$(4);" HAS INCREASED BY";X1
10633 PRINT:GOTO 10640
10634 IF LS>=7 THEN X1=RND(7)*.1 ELSE X1=RND(4)*.1
10635 RETURN:END
10640 INPUT"ENTER WHEN READY";Z
11000 CLS:PRINT TAB(10)"STREET FUND PERFORMANCE FOR YEAR";YR
11010 PRINT
11020 PRINT TAB(30)"YEAR";YR;TAB(40)"YEAR";YR-1;TAB(50)"PLAN"
11030 PRINT
11040 FOR X=2 TO 5
11050 PRINT T$(X);TAB(30)T(X,YR);TAB(40)T(X,YR-1);TAB(50)T(X,11)
11060 NEXT X
11070 PRINT:INPUT"TYPE '1' TO REVIEW THE STREET MAP, ELSE PRESS ENTER";Z:CLS:IF
Z=1 THEN 13000 ELSE 13330
13000 G2=0:G4=0:CLS:G1=G1+(PC/2)
13010 FOR X=1 TO 8
13020 IF X>5 THEN G5=64 ELSE G5=2
13030 IF X>5 THEN G6=.5 ELSE G6=.25
13040 IF X=4 OR X=6 THEN 13120
13050 FOR Y=A(X,1) TO A(X,2) STEP G5
13060 G2=G2+G6
13070 IF G2<=G1 PRINT@Y,"+";
13080 IF G2>G1 PRINT@Y,"-";
13090 NEXT Y
13100 NEXT X
13110 GOTO 13170
13120 FOR Y=A(X,1) TO A(X,2) STEP G5
13130 G4=G4+G6
13140 IF G4<=T(3,YR) PRINT@Y,"*";
13150 IF G4>T(3,YR) PRINT@Y,"#";
13160 GOTO 13090
13170 PRINT@13,"I-196";
13180 PRINT@30,"ASH";
13190 PRINT@46,"OAK";
13200 PRINT@128,"1ST";
13210 PRINT@384,"2ND";
13220 PRINT@640,"3RD";
13230 PRINT@704,"I-465";
13240 PRINT@896,"4TH";
13250 PRINT@242,"PRIMARIES";
13260 PRINT@311,"+=";G1;
13270 PRINT@375,"-=";44-G1;
13280 PRINT@498,"INTERSTATES";
13290 PRINT@567,"*=";T(3,YR);
13300 PRINT@631,"#=";16-T(3,YR);
13310 PRINT@960,"+,* = COMPLETE    -,# = INCOMPLETE":
13320 PRINT@1004,"PRESS ENTER";:INPUT Z
13330 CLS:PRINT TAB(12)"TRANSIT PERFORMANCE REVIEW FOR YEAR";YR:PRINT
13340 PRINT TAB(30)"YEAR";YR;TAB(40)"YEAR";YR-1;TAB(50)"PLAN"
13350 FOR X=1 TO 4
13351 IF X>1 THEN 13360
13352 PRINT S$(X);TAB(30);:PRINT USING FB;S(X,YR);:PRINT TAB(40);:PRINT USING FB
;S(X,YR-1);:PRINT TAB(50);:PRINT USING FB;S(X,11):GOTO 13370
13360 PRINT S$(X);TAB(30)S(X,YR);TAB(40)S(X,YR-1);TAB(50)S(X,11)
13370 NEXT X
13375 PRINT S$(5);TAB(30)S(5,YR);TAB(40)S(5,YR-1)
13380 PRINT:INPUT"PRESS ENTER";Z:CLS
14000 IF T(2,YR)<T(2,11) THEN 15100
14005 IF T(3,YR)<T(3,11) THEN 15100
14010 IF T(4,YR)>T(4,11) THEN 15100
14015 IF T(5,YR)>T(5,11) THEN 15100
14020 IF S(1,YR),S(1,11) THEN 15100
14025 IF S(2,YR)>S(2,11) THEN 15100
14030 IF S(3,YR)>S(3,11) THEN 15100
14035 IF S(4,YR)>S(4,11) THEN 15100
14040 CLS:PRINT CHR$(23):PRINT:PRINT"CONGRATULATIONS!"
14045 PRINT:PRINT"YOU HAVE SUCCESSFULLY COMPLETED":PRINT"THE TRANSPORTATION PLAN
 IN":PRINTYR;" YEARS.":PRINT
14050 IF YR>7 THEN 14060
14055 PRINT"YOUR PERFORMANCE HAS BEEN SO":PRINT"GOOD THAT YOU HAVE BEEN ASKED":P
RINT"TO BECOME THE NEW SECRETARY":PRINT"OF TRANSPORTATION.":GOTO 14200
14060 IF YR=10 THEN 14070
14065 PRINT"BECAUSE OF YOUR PERFORMANCE":PRINT"YOU HAVE BEEN ASKED TO BECOME":PR
INT"THE TRANSPORTATION DIRECTOR OF":PRINT"NEW YORK CITY.":GOTO 14200
14070 PRINT"YOU HAVE BEEN GIVEN A LARGE":PRINT"PAY RAISE AND HAVE BEEN ASKED":PR
INT"TO CONTINUE AS TRANSPORTATION":PRINT"DIRECTOR OF RIVER CITY."
14200 STOP:END
15100 CLS:IF YR=1 THEN 2990
```

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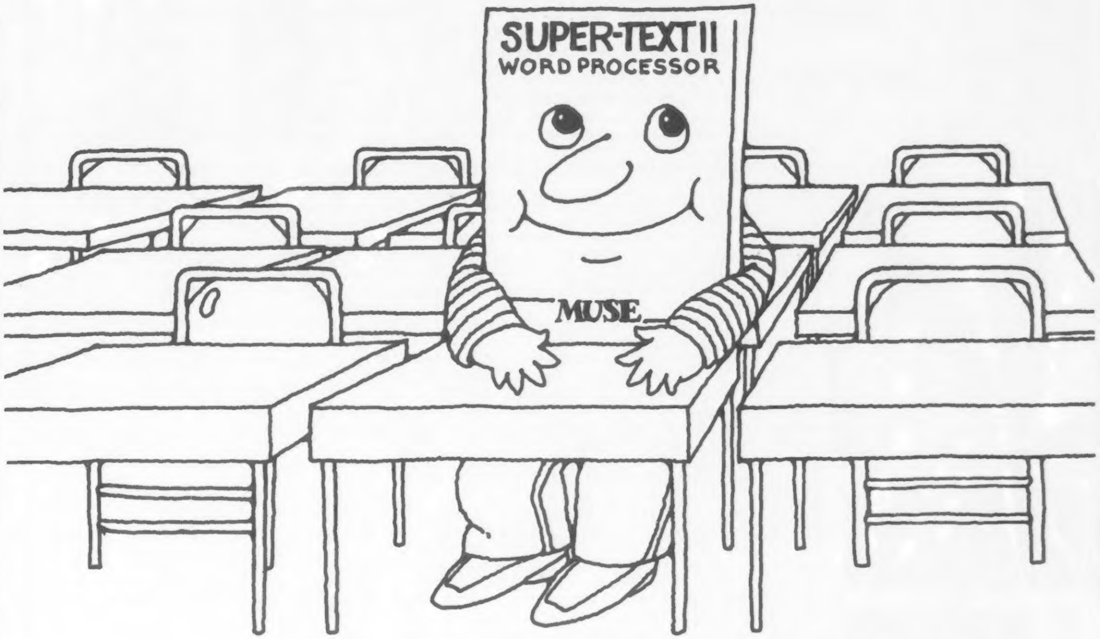

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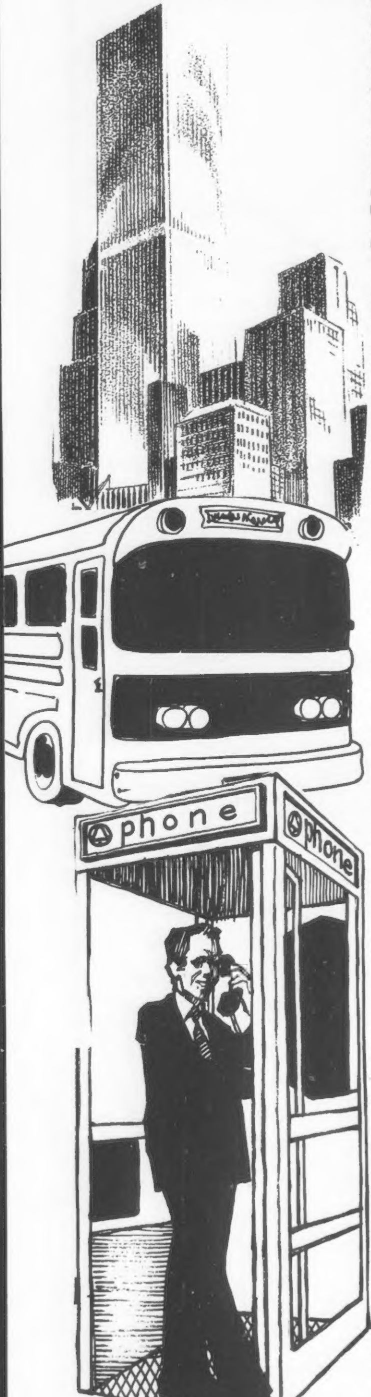

```
15110 PRINT TAB(15)"PERFORMANCE EVALUATION FOR YEAR";YR:PRINT
15120 IF T(4,YR)<T(4,YR-1)+.1 OR T(4,YR-1)<T(4,YR-2)+.1 THEN 15130
15121 CV=CV-1:PRINT"STREET CONDITIONS HAVE WORSENED FOR TWO STRAIGHT YEARS."
15130 IF T(5,YR)<T(5,YR-1)+.1 OR T(5,YR-1)<T(5,YR-2)+.1 THEN 15140
15131 CV=CV-1:PRINT"TRAFFIC SAFETY HAS WORSENED TWO STRAIGHT YEARS."
15140 IF T(4,YR)<T(4,YR-1)*1.35 THEN 15150
15141 CV=CV-1:PRINT"STREET CONDITIONS HAVE WORSENED BY OVER 35 % THIS YEAR."
15150 IF T(5,YR)<T(5,YR-1)*1.4 THEN 15160
15151 CVTCV-1:PRINT"TRAFFIC SAFETY HAS WORSENED BY OVER 40 % THIS YEAR."
15160 IF T(2,YR)>=T(2,YR-2)+5 THEN 15169
15161 CV=CV-1:PRINT"PRIMARY STREET CON;TRUCTION IS NOT PROGRESSING WELL."
15169 IF YR<7 OR YR=10  THEN 15180
15170 IF T(3,YR)>=(YR*2)-4 OR G1>=13+(YR*3) THEN 15180
15171 CV=CV-1:PRINT"TH)RE IS FEELING YOU WILL NOT COMPLETE THE STREET PLAN."
15180 IF T(4,YR)<T(4,YR-1) OR T(5,YR)<T(5,YR-1) OR T(2,YR)>T(2,YR-2)+4 THEN 1519
OB*USRM;CV=CV-1:PRINT"THERE IS GENERAL DISSATISFACTION WITH STREET FUND PERFORMA
NCE."
15181 CV=CV-1:PRINT"THERE IS GENERAL DISSATISFACTION WITH STREET FUND PERFORMANC
E."
15190 IF S(1,YR)>S(1,YR-1) OR S(1,YR-1)>S(1,YR-2) THEN 1b200
15191 CV=CV-1:PRINT"BUS RIDERSHIP HAS DECLINED TWO STRAIGHT YEARS."
15200 IF S(2,YR)<S(2,0)+4 THEN 15210
15201 CV=CV-1:PRINT"THE BUS FLEET HATHEN BEEN ALLOWED TO DETERIORATE."
15210 IF S(3,YR)<S(3,YR-1)+.1 OR S(3,YR-1)<S(3,YR-2)+.1 THEN 15220
15211 CV=CV-1:PRINT"BUS DOWNTIME HAS INCRECSED TWO STRAIGHT YEARS."
15220 IF S(3,YR)<S(3,YR-1)*1.35 THEN 15230
15221 CV=CV-1:PRINT"DOWNTIME HAS INCREASED OVER 35 % THIS YEAR."
15230 IF "(4,YR)<S(4,YR-1)+.1 OR S(4,YR-1)<S(4,YR-2)+.1 THEN 15240
15231 CV=CV-1:PRINT"ON-SCHEDULE PERFORMANCE HAS DECLINED TWO STRAIGHT YEARS."
15177 IF S(4,YR)<S(4,YR-1)*1.35 THEN 15250
15241 CV=CV-1:PRINT"ON-SCHEDULE PERFORMANCE HAS DECLINED OVER 35 % THIS YEAR."
15250 IF S(1,YR)<S(1,YRH1) THEN X1=.3 ELSE X1=0
15260 FOR X=2 TO 4:IF S(X,YR)>S(X,YR-1) THEN X1=X1+.3:NEXT X
15270 IF X1<1 THEN 15280
15271 CV=CV-1:PRINT"THERE IS DISSATISFACTION W!TH TRANSIT AUTHORITY PERFORMANCE.
"
15280 IF TB(2,YR)<7.5 OR RND(3)>2 THEN 15290
15281 CV=CV-2:PRINT"CITIZENS ARE UNHAPPY WITH THE HIGH TAX RAT)."
15290 IF T(2,YR)+T(3,YR)<T(2,YR-2)+T(3,YR-2)+11 OR T(3,YR)<T(3,YR-1)+2 THEN 1530
0
15291 CV=CV+1:PRINT"OVERALL STREET CONSTRUCTION IS PROGJESSING WELL."
15300 IF T(4,YR)>T(4,YR-1)-.1 OR T(4,YR-1)>T(4,YR-2)-.1 THEN 15310
15301 CV=CV+1:PRINT"STREET CONDITIONS HAVE IMPROVED TWO STRAIGHT YEARS."
15310 IF T(4,YR)>T(4,YR-1)*.65 THEN 15320
15311 CV=CV+1:PRINT"STREET CONDITIONS HAVE IMPROVED OVER 35 % THIS YEAR."
15320 IF T(5,BR)>T(5,YR-1)-.1 OR T(5,YR-1)>T(5,YR-2)-.1 THEN 15330
15321 CV=CV+1:PRINT"TRAFFIC SAFETY HAS IMPROVED TWO STRAIGHT YEARS."
15330 IF T(5,YR)>T 5,YR-1)*.6 THEN 15350
15331 CV=CV+1:PRINT"TRAFFIC SAFETY HAS IMPROVED OVER 40 % THIS YEAR."
15350 IF S(2,YR)>S(2,YR-1)-.1 OR S(2,YR-1)>S(2,YH-2)-.1 THEN 15360
15351 CV=CV+1:PRINT"BUS FLEET AGE HAS IMPROVED TWO STRAIGHT YEARS."
15360 IF S(3,YR)>S(3,YR-1)-.1 OR S(3,YR-1)>S(3,YR-2)-.
15361 CV=CV+1:PRINT"DOWNTIME HAS DECREASED TWO STRAIGHT YEARS."
15370 IF S(3,YR)>S(3,YR-1)*.65 THEN 15380
15371 CV=CV+1:PRINT"DOWNTIME H(S BEEN REDUCED OVER 35% THIS YEAR."
15380 IF S(4,YR)>S(4,YR-1)-.1 OR S(4,YR-1)>S(4,YR-2)-.1 THEN 15390
15381 CV=CV+1:PRINT"ON-SCHEDULE PERFO1MANCE HAS IMPROVED TWO STRAIGHT YEARS."
15390 IF S(4,YR)>S(4,YR-1)*.65 THEN 15400
15391 CV=CV+1:PRINT"ON-SCHEDULE PERFORMANCE HAS IMPROVED HVER 35% THIS YEAR."
15400 IF S(1,YR)>S(1,YR-1) THEN X1=.3 ELSE X1=0
15410 FOR X=2 TO 4:IF S(X,YR)<S(X,YR-1) THEN X1=X1+.3:NEXT X
15420 IF X1<1 THEN 15430COSERRTHEN=<CV=CV+1:PRINT"TRANSIT AUTHORITY PERFORMANCE
IS PROGRESSING WELL."
15421 CV=CV+1:PRINT"TRANSIT AUTHORITY PERFORMANCE IS PROGRESSING WELL."
15430 IF TB(2,YR)>3 OR RND(3)>2 THEN 15435
15431 CV=CV+1:PRINT"CITIZENS ARE HAPPY WITH THE LOW TAX RATE."
15435 IF YR=6 OR YR=9 THEN 15436 ELSE 15490
15436 IF B1=0 THEN 15490
15440 IF B2>T(4,YR) AND B2>0 THEN 15480
15450 IF B3>T(5 YR) AND B3>0 THEN 15480
15460 IF T(2,YR)<T(2,YR-3)-B4 AND B4>0 THEN 15480
15470 IF T(3,YR)>T(3,YR-3)-B5 AND B5>0 THEN 15490
15480 CV=CV-2:PRINT:PRINT"YOU HAVERENEGED ON YOUR BOND REFERENDUM PLEDGE."
15490 PRINT@960,"PRESS ENTER";:INPUT Z:CLS:IF CV>11 THEN CV=11
15491 IF CV<0 THEN CV=0
15492 IF CV<6 THEN 15494
15392 IF YR=10 THEN 15498
15494 PRINT:PRINT"AS A RESULT OF YOUR PERFORMANCE THIS YEAR THE CITY"
15495 IF CV>=6 PRINT"COMMISSION HAS VOTED";CV;"-";11-CV;"TO RETAIN YOU ANOTHER Y
EAR."
15496 IF CV<6 PRINT"COMMISSION HAS VOTED TO REQUEST YOUR RESIGNATION."
15497 IF CV>=6 THEN 15500 ELSE 15501
15498 PRINT*CHR$(23):PRINT:PRINT"YOU HAVE NOT SUCCESSFULLY":PRINT"COMPLETED THE
TEN YEAR PLAN.":PRINT:PRINT"HOWEVER, THE CITY COMMISSION":PRINT"HAS VOTED";CV;"-
";11-CGOTO;" TO RETAIN YOU":PRINT"AS ASSISTANT TRANSPORTATION":PRINT"DIRECTOR."
15499 GOTO 15501
15500 PRINT:INPUT"PRESS ENTER";Z:GOTO 2990
15501 PRINT:PRINT"ENTER 'RUN' IF YOU WISH TO":PRINT"TRY AGAIN.":STOP:END
```

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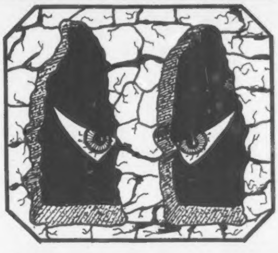

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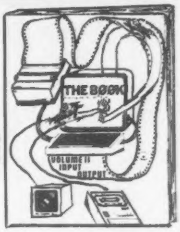

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FOG INDEX

R. B. Nottingham

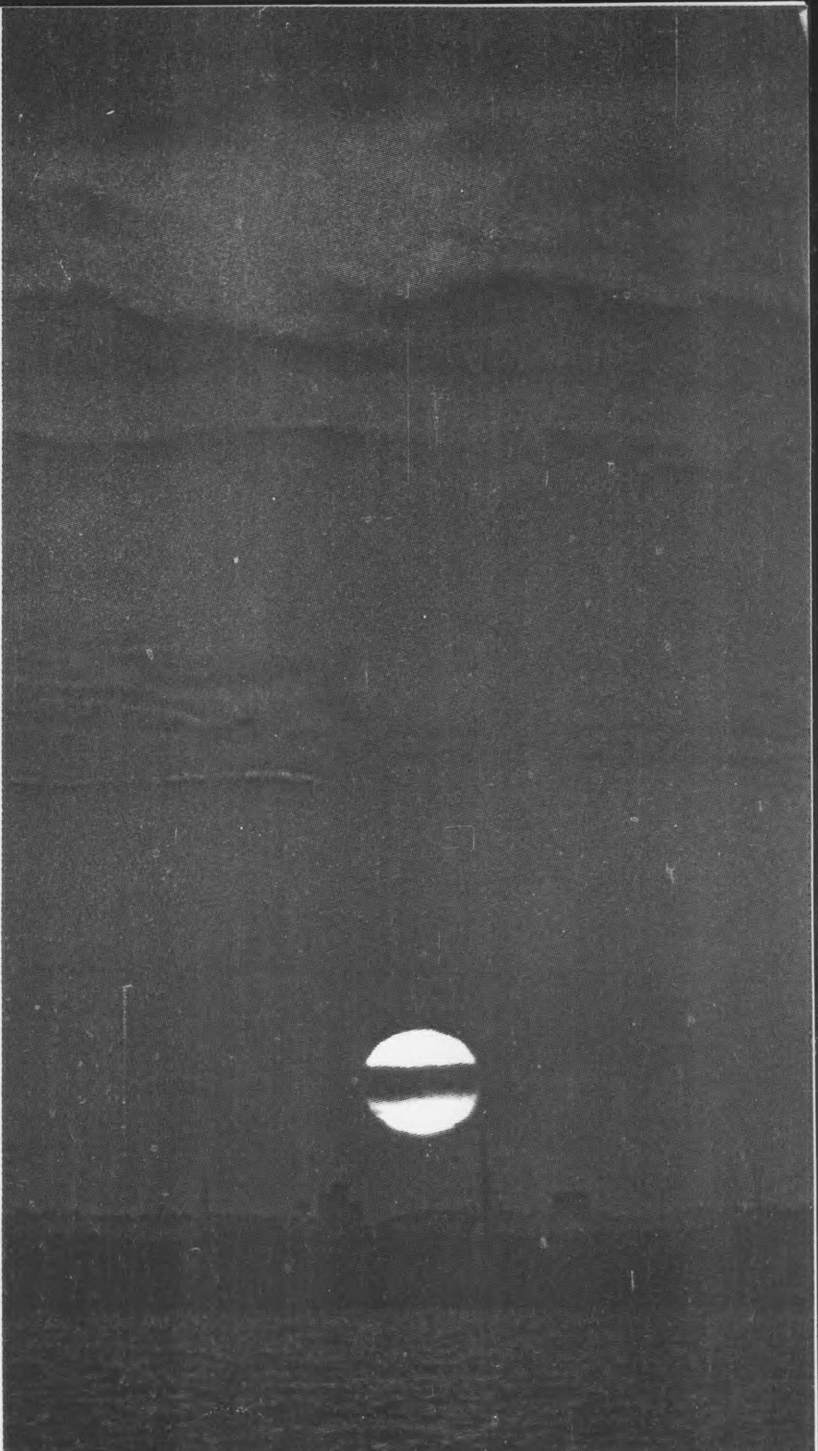
On page 17 of the November 1980 issue, I mentioned an article in **The Wall Street Journal** *on readability. Mr. Nottingham has now taken the "Fog Index" described in the article and computerized it. He computed the index for several pieces in* **Creative** *and other publications but excluded his own article. Why not use his program to compute it and compare it to your own writing. Hint: Mr. Nottingham will be tough to beat.—DHA*

Recently, *The Wall Street Journal* had an article on clarity of writing and its importance to industry. It cited a "Fog Index," developed by the Gunning-Mueller Clear Writing Institute. The Fog Index is roughly equal to the years of schooling required to read a piece of writing.

It is simply the average sentence length plus the percentage of words having three or more syllables, all multiplied by .4.

Now I am not a game player. I like to solve problems but only if they have some practical application. Programming the Fog Index seemed like a trivial but useful piece of work. Now how do you count the number of syllables in a word?

R. B. Nottingham, The Book Rack, 1619 SE 3rd Court, Deerfield Beach, FL 33441



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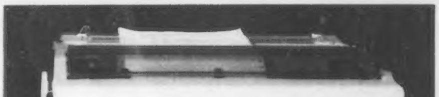

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Fog Index, continued...

```
10 '        ***   FOG INDEX   ***
20 '    BY  R. B. NOTTINGHAM, LIGHTHOUSE POINT, FLORIDA
30 REM A=LAST LETTER. B= LETTERS. S=SYLLABLES. L=WORD LENGTH
   NS=NUMBER OF SENTENCES. W=NUMBER OF WORDS. LW=NUMBER OF
   LONG WORDS. V=VOWEL COUNTER.
40 CLS
50 PRINT"THIS PROGRAM CALCULATES THE FOG INDEX OF TEXT.  THIS
 IS EQUAL TOTHE GRADE LEVEL OF READER FOR WHICH IT IS SUITABLE.
 IN TYPING TEXT, USE ONLY ONE SPACE AFTER A PERIOD AND IGNORE
 ALL OTHER PUNCTUATION. THE PROGRAM WILL STOP WHEN YOU HAVE";
60 PRINT" A 100 WORD    SAMPLE. IF YOU MAQKE AN ERROR, DO NOT
 BACKSPACE TO CORRECT IT. ITWILL MAKE LITTLE DIFFERENCE IN THE
 SCORE.":PRINT
70 INPUT"PRESS ENTER TO BEGIN";QZ$
80 CLS: DEFSTR A-B : DEFINT C-Z
90 A=INKEY$: IF A="" THEN GOTO 90
100 PRINT A;
110 B=B+A : IF LEN(B) >4 THEN B=RIGHT$(B,4)
120 IF A=CHR$(32) THEN W=W+1  : REM SPACE W=NUMBER OF WORDS
130 IF A=CHR$(46) THEN NS=NS+1:REM 46=PERIOD S=NO OF
 SENTENCES
140 IF A="A"OR A="E" OR A="I" OR A="O" OR A="U" OR A="Y"
 THEN S=S+1 : V=V+1 :ELSE V=0 : GOTO 160  : REM COUNTS VOWELS
 CONSIDERED EQUAL TO SYLLABLES
150 IF V=2 THEN S=S-1 :V=0 :REM ELIMINATES DOUBLE VOWEL
160 IF RIGHT$(B,4)="DED " OR RIGHT$(B,4)="TED " THEN GOTO 180
17- IF RIGHT$(B,3)="ED " THEN S=S-1
180 IF RIGHT$(B,3)="LE "THEN GOTO 200
190 IF RIGHT$(B,2)="E "THEN S=S-1
200 IF A=CHR$(32) AND S>2 THEN LW=LW+1 :REM COUNTS LONG WORDS
 3 OR MORE SYLABLES
210 IF A=CHR$(32) THEN S=0
220 IF W=>100 AND A=CHR$(46) THEN GOTO 260  : REM STOPS
AT END OF SENTENCE WITH 100 OR MORE WORDS.
230 IF A=CHR$(13) THEN GOTO 260  : REM STOPS IF ENTER IS PRESSED
240 A=""
250 GOTO 90
260 PRINT:PRINT"NUMBER OF SENTENCES =";NS
270 PRINT"NUMBER 0F WORDS";W
280 PRINT"WORDS PER SENTENCE =";W/NS
290 PRINT"NUMBER OF LONG WORDS =";LW
300 F=(W/NS +100*LW/W)*.4:REM CALCULATES THE "FOG INDEX"
310 PRINT"FOG INDEX =";F
```

If you would like to make a game of this, solve the problem before reading further or looking at the program.

Let us say, that a syllable always has a vowel. The number of syllables equals the number of vowels. Uhuh, how about the word "pear"? Two vowels but only one syllable. All right, we will not count double vowels; that is, two vowels in succession. Fine. How about the word "piece"? O.K. so we don't count final "e"s. Then consider "syllable." If we don't count the final "e" it would have only two syllables. Sooo—we make an exception for "le," if it is final "le."

After some hours of head scratching I finally arrived at the following theorem: Any word having three or more vowels (a,e,i,o,u,y) has three or more syllables if:

Double vowels are counted as one.

Final "e" and final "ed" are not counted except in the case of "ded," "ted," and "le."

Now I know this theorem is not correct. It doesn't cope with double "e" as in Whoopee! However, I feel that it is close enough for practical purposes. If a reader would like to take a few thousand words of text, mark the words of three or more syllables, then apply the theorem and determine the percentage error, I would be grateful. And amazed. Seriously, any suggestions for significant improvement will be gratefully received.

Now, unless you have a computer with good string handling abilities, including RIGHT$, skip the next few paragraphs and go to the results at the end. If you have a TRS-80, the program is in its language, Microsoft Level II Basic. The short program shown, is liberally sprinkled with remarks, but at the risk of redundancy, we will explain it.

To begin, please note (and applaud) that the program is uniformly numbered in increments of 10 with no missing lines. The peculiar appearance of lines 50-60 is due to the screen format of the TRS-80 plus the addition of returns to accommodate my printer. Line 70 begins the input, line 110 puts it on the screen. Line 100 builds the characters into a string.

Line 120 detects the ASCII for "space" to count words. Line 180 similarly counts sentences. Now the fun of counting syllables begins. Line 140 detects vowels and tentatively counts syllables. V is incremented to detect double vowels. Line 140 decrements the syllable count for two consecutive vowels. Line 160 detects "ded" or "ted" and by jumping to line 180, bypasses 170 which rejects "ed." Note that the sub-strings must include a space since we are only concerned here with word endings. Line 180 similarly bypasses 190 to keep "le" from being rejected under the final "e" rule.

Now things get easier. Line 200 detects word ends via the ASCII for "space," tests for three or more syllables in the word and if found, increments the "long word" count. Line 210 resets the syllable count for the next word. Line 220 tests for 100 or more words (minimum size for an adequate sample) and stops at the end of the sentence.

Line 230 detects the ASCII for "enter" and makes it possible to break off the testing before 100 words so that you may test the program or satisfy your curiosity. Line 250 goes back for the next letter. You will note that many things are happening between one character and the next. If you are a speed typist, you may have to slow your pace. Pretend you are running an old-fashioned Teletype. One note, which you may wish to add to the instructions, is that where a sentence has a clearly independent clause, it should be treated as a separate sentence. Use periods to break it into two sentences.

Now for results. A logical source for samples was the August issue of *Creative Computing*. First, the expert, E.H. Weiss, Ph.D., on page 138. Not bad. Based chiefly on the last section of the column the Fog Index is 14.3. About right for a junior college graduate which is probably a conservative estimate of the average reader. How about the Big Boss himself, on p. 134? Very good, 11.2, perhaps he deserves a raise. Doug Green on p. 26? Very good, 14.8. George Blank, on p. 154? Fine, 11.5. You knew it was a good magazine didn't you?

How does this compare with the rest of the world? The Fort Lauderdale Sunday paper: a wire service writer, 21.3! A local reporter, 11.5; the editorial page editor, 14.6, and Max Rafferty's column, 10.4. A British authority writing to jet pilots, 16.4, and a random sample from one of our government's Aircraft Accident Reports 22.8! What else would you expect from a bureaucrat?

Since I am not a Junior Citizen it gives me pleasure to note that mature writers seem to write more simply than younger ones. Probably for several reasons; simplicity requires self-assurance. If you are not sure that you really have anything to say, make it impressively difficult to read. Older writers on the average received a better education, including the study of Latin and the classics. Well, "Sic transit gloria Tuesday." Have fun. ☐

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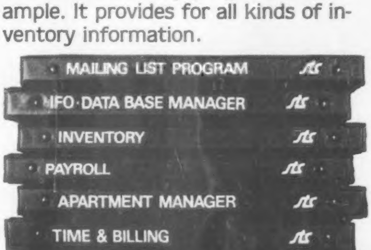

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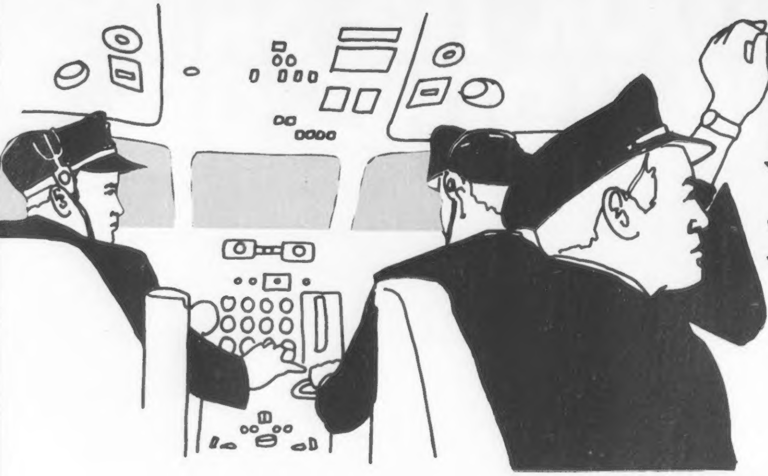


LANDING SIMULATOR

Jake Jacobs

I have always wanted to learn how to fly an airplane but never took the time. After I had my Apple computer for a few weeks and had impressed myself with its capabilities, I undertook the task of developing a simple landing simulator in Applesoft Basic. To keep it simple and also to minimize the flicker on the screen I eliminated banking and turning. The controls are the "stick" which moves only forwards and backwards (not left or right) and the 'throttle' which controls power from 0 to 100 percent. Both controls are simulated by the game paddles. Paddle 0 is the stick and paddle 1 is the throttle.

The screen displays the pilot's view of the runway using hi-res graphics. The lower four text lines simulate the pilot's instruments. These are: ALTitude in feet, rate of CLIMB or descent, in feet/minute, VELocity in knots, DME (distance measuring equipment) which indicates the distance in nautical miles from the front end of the runway, and percent POWER applied by the throttle. There is also a glide-slope indicator which shows the pilot whether he or she is on the 3.5 degree glide slope when approaching the runway.

There are two principle parameters to be computed: distance from the runway (X) and altitude (ALT). The program is a continuous loop. During every pass through this loop the program calculates the new values of X and ALT from the old values. For example X is calculated from the old X by the statement X = X + V, where V is the current velocity. Similarly, the new altitude is calculated by adding the rate of climb to the old altitude. These values are derived from the two input variables, the stick and the throttle. Once the values of X and ALT are computed, the view of the runway as seen by the pilot is then calculated and displayed in hi-res graphics. But first the old image of the runway is erased by redrawing it with HCOLOR set equal to 0.

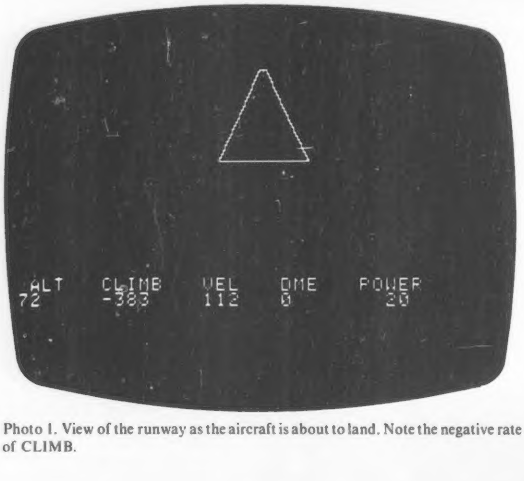
I undertook the task of developing a simple landing simulator in Applesoft Basic.

The runway appears as a trapezoid in most cases. Since banking and turning are not simulated, the view of the runway is always symmetrical about an imaginary vertical line down the center of the screen (see Photo 1). Therefore only four values have to be calculated: the vertical positions of the horizontal lines which simulate the rear and front of the runway, and the widths of the rear and front of the runway.

Interestingly, no trigonometric functions have to be used. Only the simple geometry of similar triangles is applied. Figure 1 depicts a side view of the aircraft and the runway. The pilot's eye is assumed to be one foot away from the windshield

---

Jake Jacobs, 1903 Fordham Way, Mountain View, CA 94040.



```
ALT   CLIMB   VEL   DME   POWER
72    -383    112   0        20
```

Photo 1. View of the runway as the aircraft is about to land. Note the negative rate of CLIMB.

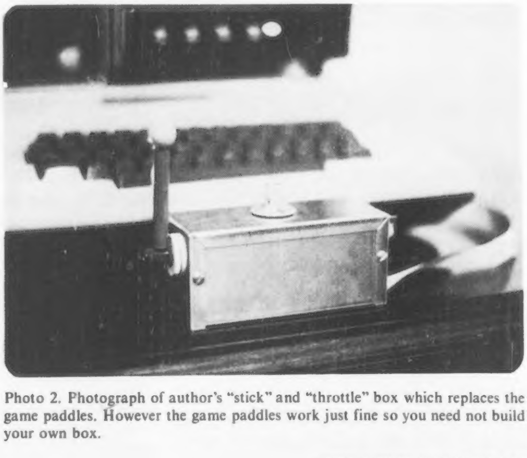


Photo 2. Photograph of author's "stick" and "throttle" box which replaces the game paddles. However the game paddles work just fine so you need not build your own box.

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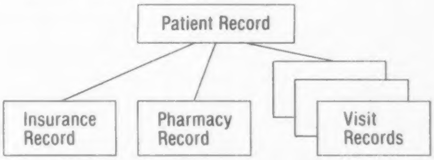

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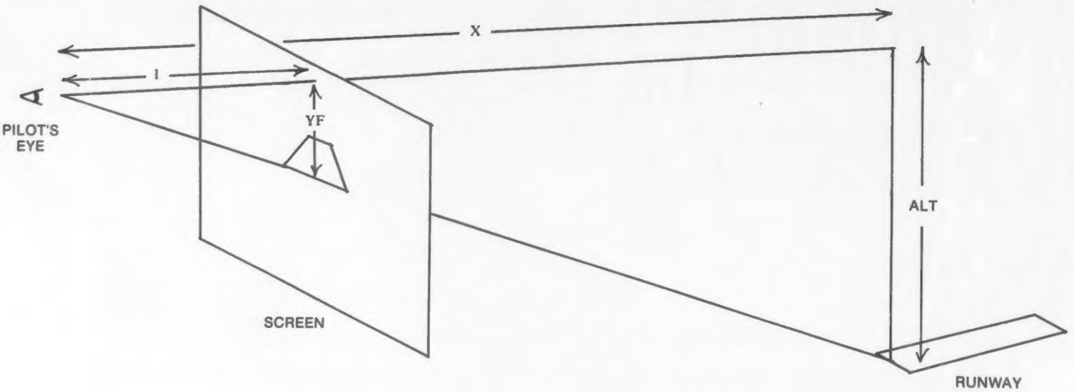

Figure 1. Side view of aircraft illustrating how the screen position of the front of the runway, YF, is calculated. Only simple similar triangles are used.

(i.e., the TV monitor, but you don't have to sit that close to your screen; the one foot is for calculation purposes only). Therefore the Y offset from the top of the screen (YF) of the front of the runway view is calculated from similar triangles as follows:

$$\frac{YF}{1} = \frac{ALT}{X}$$

YF must be scaled by multiplying it by 159, the maximum Y value that can be HPLOTed. If you have followed this so far, you will realize that for some values of X and ALT, YF could have a value that would plot off the bottom of the screen. In fact much of the program loop is taken up calculating what parts of the view of the runway are off the screen and correcting for this so that the HPLOT statements do not "blow up."

In a similar fashion, YR, the Y offset of the rear of the runway, is calculated. The same principle of similar triangles is employed to calculate the widths of the front and rear of the runway, and will not be described here.

A word about programming. Note that all constants used in the program are actually variables that are initialized at the beginning of the program. This was done for three reasons.

1. During run-time, variables are accessed faster than the time it takes for numeric constant strings to be evaluated.

2. When writing the program it was much easier to change a single assignment statement at the beginning of the program than to find all occurences of a particular constant throughout the program.

3. Using variables instead of numeric constants makes the program much more readable and self documenting. Note that some constants have the same value as others, but are given different names. (Remarks were included in the original program but many were deleted for this article to allow the program to run on a 16K machine.)

Here we introduce exponential smoothing, which is a fancy term for something quite simple.

If, for example, one wished to change the length of the runway from 4000 feet to 6000 feet, one would merely change the assignment statement 280 to RW = 6000. All occurences of the "constant" RW (and there are many) will be changed correctly.

Flying the Airplane

You start at a random distance from the runway and at a random altitude. The runway starts out as a small dot or line on the screen. As you approach the runway it will become larger and take on the appearance of a trapezoid. The program is calculating what the runway should really look like from your given altitude and distance from the runway. The throttle controls primarily your rate of climb and descent. The stick controls primarily your airspeed but also your rate of climb and descent. This is just the opposite of what most people think, but that is how an airplane really works. The best way to "fly" the plane is to place paddle 1 (throttle) on the table and put the stick (paddle 0) in your left hand and control it with your right hand. Then you can reach up to the table to adjust the throttle with your right hand. The author has built a "stick" and "throttle" in a small metal box as shown in Photo 2, but the game paddles work just fine.

The ALTitude and CLIMB indicators work together. Your altitude is shown in feet (from the ground) and the CLIMB indicator shows your rate of climb in feet per minute if positive or descent if negative. The VELocity indicator shows airspeed in knots or nautical miles per hour. A nautical mile is 6000 feet. The DME indicator is the Distance Measuring Equipment and indicates your distance from the front end of the runway in nautical miles. After you pass over the front of the runway the DME will begin to increase in value, rather than decrease as you approach the runway, because you are moving away from the front of the runway. The POWER indicators merely parrots the throttle setting from 0 to 100 percent. The last indicator on the right is the glide-slope indicator. Imagine an invisible line with a 3.5 degree slope raising towards you from the front of the runway. As you land you should stay on this imaginary line. The glide-slope indicator tells you if you are on this line and if not, what you should do:

– means you are on the glide-slope
^ means that you should climb (you are too low)
V means that you should go down (you are too high).

When you are very close to the runway, you should ignore the glide-slope indicator since it applies to the front of the runway and you never actually land at the very front of the runway.

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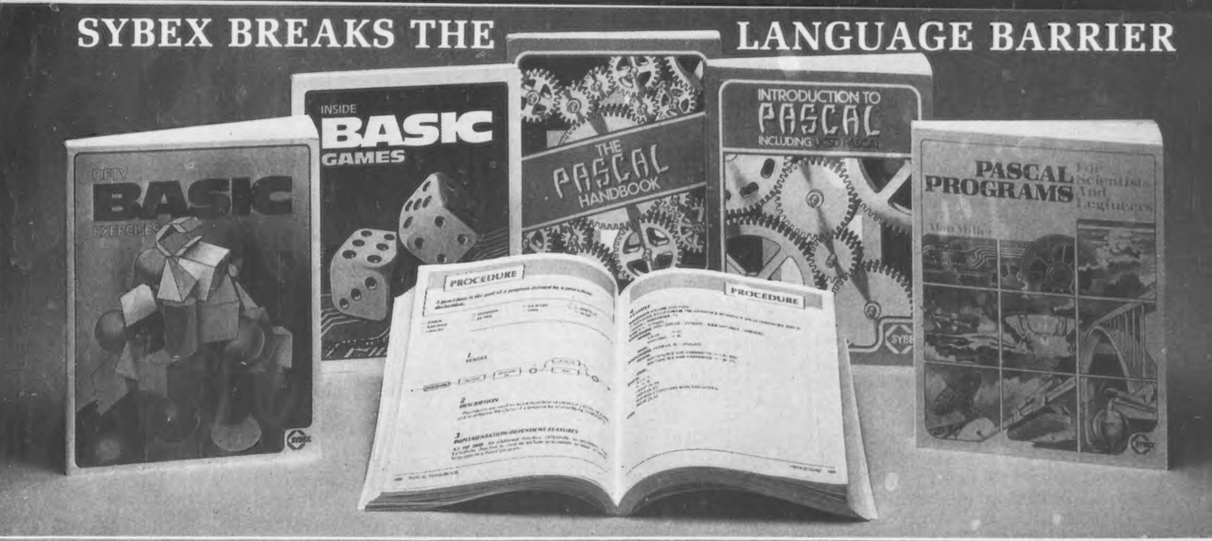
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Landing, continued...

There are three markers on the runway, one every 1000 feet. These give you some idea how much runway you have left when landing. If you decide to change the length of the runway (see below), the markers will space themselves correctly ¼, ½ and ¾ the distance down the runway.

When cruising your throttle should be set at about 75 percent. When climbing you should be at 100 percent throttle. When landing, 20 percent is about right. You must land with a descent of less than 150 feet/minute, otherwise you will crash. If your velocity falls below 60 knots you will stall and your rate of descent will become -2000 feet/minute. But you can recover by pushing the stick foward to increase your lift. You can crash in other ways. If you hit the ground before you are over the runway you have crashed. If you touchdown on the runway but there is too little runway remaining you will crash off the end of the runway. And of course you can always fly over the runway and not touch down at all. All of these conditions are indicated by messages on the screen.

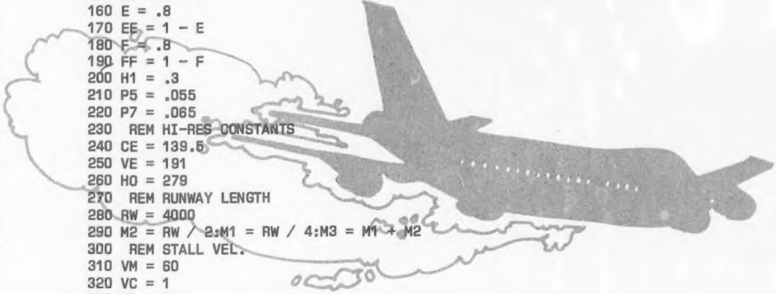
The Program

Lines 10 through 410 initialize variables that are used as constants. Some that might be of interest if you wish to modify the program are Line 310, VM — stall velocity, Line 380, AM — minimum altitude, below which you are considered to be on the ground, and Line 400, RC — crash descent, above which you have landed too hard. Lines 450 and 460 establish the initial values for X and ALT. You may choose to change the algorithms for these initial conditions.

Line 500 starts the main loop of the program, which runs down to line 840. This loop is for a trapezoidal runway view. There are a couple of branches to lines 850 or 1040 if the runway view is partially off of the screen. The main loop calculates and plots the runway view. Subroutine 1200 is the main subroutine in the program. It sets P0 and P1 to the paddle values and uses these to calculate a new velocity, V, from the old V. Here we introduce exponential smoothing, which is a fancy term for something quite simple. Smoothing creates lag or inertia into some variables. For example, the velocity should not change instantaneously (nor should the rate of change of altitude or the pitch angle of the aircraft). These variables are permitted to change only gradually. Let us look at a simplified version of line 1240 for calculating V.

$$V = .95\ V + .05\ DV$$

where DV is the change of velocity (based on the stick and throttle positions) and is used here for illustrative purposes only. The new velocity is the old velocity plus the change in velocity, DV. But we only let the DV term influence 5 percent of the new velocity and let the old velocity influence



```
0  REM  VARS. FO, HO, RO, XO: SECOND CHARACTER IS A LETTER "OH"; P0: SECOND
 CHARACTER IS DIGIT "ZERO"
10  TEXT : HOME
20  GOSUB 1700
30  REM CONSTANTS
40 CZ = 2
50 C1 = 0
60 C2 = .03
70 C3 = .7
80 C4 = .09
90 C5 = .39
100 C8 = 30
110 C9 = .09
120 DC = 100
130  REM EXPONENTIAL SMOOTHING
140 D = .95
150 DD = 1 - D
160 E = .8
170 EE = 1 - E
180 F = .8
190 FF = 1 - F
200 H1 = .3
210 P5 = .055
220 P7 = .065
230  REM HI-RES CONSTANTS
240 CE = 139.5
250 VE = 191
260 HO = 279
270  REM RUNWAY LENGTH
280 RW = 4000
290 M2 = RW / 2:M1 = RW / 4:M3 = M1 + M2
300  REM STALL VEL.
310 VM = 60
320 VC = 1
330 ST = 20
340 Q1 = 255
350 Q3 = 3
360 Q6 = 600
370  REM STALL DESCENT
380 AM = 5
390  REM CRASH DESCENT
400 RC = 150
410 C = 7000
420  REM INITIAL CONDX.
430 V = 100
440 HR = H1 * (Q1 -  PDL (0))
450 X = 20000 + 20000 *  RND (1)
460 ALT = 1000 + 1000 *  RND (1)
470 X1 = 0:X2 = X1:X3 = X1:X4 = X1:Y1 = X1:Y2 = Y1:Y3 = Y1:Y4 = Y1:X5 = X1:Y5
 = Y1
480  HGR
490  HOME
500  REM START MAIN LOOP
510  IF ALT < AM THEN 1400
520 YR = ALT / X * VE + HR
530  IF YR > VE OR YR < 0 THEN YR = VE
540 YF = ALT / (X - RW) * VE + HR
550 F1 = 0:F2 = F1:F3 = F1
560 R1 = ALT / (X - M1) * VE + HR: IF R1 > 0 AND R1 < VE AND X > M1 THEN
 F1 = 1
570 R2 = ALT / (X - M2) * VE + HR: IF R2 > 0 AND R2 < VE AND X > M2 THEN
 F2 = 1
580 R3 = ALT / (X - M3) * VE + HR: IF R3 > 0 AND R3 < VE AND X > M3 THEN
 F3 = 1
590  IF X - RW < ALT THEN YF = VE
600 FO = (C / (X + ALT / Q3 - RW))
610 RO = C / (X + ALT / Q3)
620  IF X - RW < ALT THEN FO = C / (ALT + ALT / Q3)
630  IF RO < 0 THEN RO = CE
640 FL = CE - FO
650 FR = CE + FO
660 RL = CE - RO
670 RR = CE + RO
680  IF RO >  = CE GOTO 1570
690  IF FO > CE THEN 850
700  IF YF > VE THEN 1040
710  HCOLOR= 0
720  IF E1 THEN  HPLOT CE,N1
730  IF E2 THEN  HPLOT CE,N2
740  IF E3 THEN  HPLOT CE,N3
750  HPLOT X1,Y1 TO X2,Y2 TO X3,Y3 TO X4,Y4 TO Y1,Y1: IF Y5 < VE THEN  HPLOT
 0,Y5 TO HO,Y5
760  HCOLOR= COL
770  IF F1 THEN  HPLOT CE,R1
780  IF F2 THEN  HPLOT CE,R2
790  IF F3 THEN  HPLOT CE,R3
800  HPLOT RL,YR TO RR,YR TO FR,YF TO FL,YF TO RL,YR
810 X1 = FL:Y1 = YF:X2 = RL:Y2 = YR:X3 = RR:Y3 = YR:X4 = FR:Y4 = YF:Y5 =
 VE
820 N1 = R1:N2 = R2:N3 = R3:E1 = F1:E2 = F2:E3 = F3
```

A one-hour LP record of eight synthesizers may change your views about computer music forever

Binary Beatles

by David Ahl

Computer music. Who needs it? It's mostly boring beep, beep, beeps or wildly modern stuff. It's certainly nothing you'd want to listen to more than once. That's what I thought about computer music and most of my friends agreed.

In 1978 I entered Yankee Doodle Dandy into my Software Technology system just to be different. Dick Moberg heard of it and asked me to perform in the Philadelphia Computer Music Festival. I agreed expecting to be the only one with something out of the ordinary. I was wrong.

Computer Accompanist

Nine individuals and groups performed in the festival. There were the usual Bach pieces but even they were different. Gooitzen van der Wal performed the last movement of the 2nd Bach Suite in a unique way. He played the flute solo while using the computer as accompaniment.

Then Dorothy Siegel did the same thing, playing the clarinet solo part of Wanhal's Sonata in b flat. The audience went wild.

Hal Chamberlin played Bach's Tocatta and Fugue in d minor. But also with a difference. He used a large computer before hand to "compute" the waveform of every instrument playing every note. It took one hour of computation time for each two minutes of playback time. The result could hardly be distinguished from the organ in the Hapsburg Cathedral.

Don Schertz had a home brewed synthesizer truly mounted on a breadboard that allowed him to control 25 parameters of each note. It produced spectacular sounds in his arrangement of Red Wing.

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In 1962, D.H. Van Lenten at Bell Laboratories produced the first talking computer. Bell engineers taught it to recite the soliloquy from Hamlet. Then they went one step further and taught it to sing Daisy both alone and accompanied by another computer. This was also performed at the festival.

Yes, the Beatles were represented. Andrew Molda played Hey Jude on his COSMAC VIP system with a program called PIN-8 (Play it Now).

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CIRCLE 187 ON READER SERVICE CARD

Landing, continued...

```
830  GOSUB 1200
840  GOTO 500
850  REM
860 YB = YF - (YF - YR) * (FO - CE) / (FO - RO)
870  IF YB < 0 THEN YB = 0
880  IF YB > VE THEN 1040
890  HCOLOR= 0
900  IF E1 THEN  HPLOT CE,N1
910  IF E2 THEN  HPLOT CE,N2
920  IF E3 THEN  HPLOT CE,N3
930  HPLOT X1,Y1 TO X2,Y2 TO X3,Y3 TO X4,Y4 TO X1,Y1: IF Y5 < VE THEN  HPLOT
 0,Y5 TO HO,Y5
940  HCOLOR= COL
950  IF F1 THEN  HPLOT CE,R1
960  IF F2 THEN  HPLOT CE,R2
970  IF F3 THEN  HPLOT CE,R3
980  HPLOT 0,YB TO RL,YR TO RR,YR TO HO,YB
990  IF YF < VE THEN  HPLOT 0,YF TO HO,YF
1000 X1 = 0:Y1 = YB:X2 = RL:Y2 = YR:X3 = RR:Y3 = YR:X4 = HO:Y4 = YB:Y5 =
 YF
1010 N1 = R1:N2 = R2:N3 = R3:E1 = F1:E2 = F2:E3 = F3
1020  GOSUB 1200
1030  GOTO 500
1040  REM
1050 XO = (VE - YR) * (FO - RO) / (YF - YR) + RO
1060  HCOLOR= 0
1070  IF E1 THEN  HPLOT CE,N1
1080  IF E2 THEN  HPLOT CE,N2
1090  IF E3 THEN  HPLOT CE,N3
1100  HPLOT X1,Y1 TO X2,Y2 TO X3,Y3 TO X4,Y4 TO X1,Y1: IF Y5 < VE THEN  HPLOT
 0,Y5 TO HO,Y5
1110  HCOLOR= COL
1120  IF F1 THEN  HPLOT CE,R1
1130  IF F2 THEN  HPLOT CE,R2
1140  IF F3 THEN  HPLOT CE,R3
1150  HPLOT CE - XO,VE TO RL,YR TO RR,YR TO CE + XO,VE
1160 X1 = CE - XO:Y1 = VE:X2 = RL:Y2 = YR:X3 = RR:Y3 = YR:X4 = CE + XO:Y4
 = VE
1170 N1 = R1:N2 = R2:N3 = R3:E1 = F1:E2 = F2:E3 = F3
1180  GOSUB 1200
1190  GOTO 500
1200  REM MAIN SUBROUTINE
1210 P1 =  PDL (1)
1220 PW =  INT (P1 * C5)
1230 PO =  PDL (0)
1240 V = D * V + DD * (PO * C3 + C8 + C4 * P1)
1250 CL = DC * DALT
1260 ALT = ALT + DALT
1270 VV = V * VC
1280  VTAB 22: HTAB 1
1290  PRINT  TAB( 2);"ALT"; TAB( 8);"CLIMB"; TAB( 16);"VEL"; TAB( 22);"DME";
 TAB( 28);"POWER"
1300  VTAB 23: HTAB 1
1310 AR$ = "-"
1320  IF ALT > P7 *  ABS (X - RW) THEN AR$ = "V"
1330  IF ALT < P5 *  ABS (X - RW) THEN AR$ = "^"
1340  PRINT  TAB( 1); INT (ALT); TAB( 8); INT (CL); TAB( 16); INT (VV); TAB(
 22); INT ( ABS ((X + ALT / Q3 - RW) / Q6)) / 10; TAB( 30);PW;"  "; TAB(
 38);AR$
1350 X = X - V
1360 DALT = E * DALT + EE * (C2 * P1 - V * C1 - C9 * PO + CZ)
1370  IF V < VM THEN DALT =  - ST
1380 HR = F * HR + FF * H1 * (Q1 - PO)
1390  RETURN
1400  REM LANDED!
1410  IF X > RW GOTO 1510
1420 X = X - 10 * V
1430  IF X < 0 GOTO 1630
1440  IF CL <  - RC GOTO 1780
1450  PRINT "YOU LANDED AT "; INT (VV);" MPH AND STOPPED "
1460  PRINT  INT (X);" FEET FROM THE END OF THE RUNWAY."
1470  PRINT "YOU WERE DESCENDING AT "; -  INT (CL);" FEET/MINUTE."
1480  GET Z$
1490  TEXT : HOME
1500  GOTO 20
1510  REM
1520  TEXT : HOME
1530  GOSUB 1850
1540  PRINT "YOU CRASHED "; INT (X - RW);" FEET SHORT"
1550  PRINT "OF THE RUNWAY AT "; INT (VV);" MPH. TRY AGAIN"
1560  GOTO 20
1570  REM
1580  TEXT : HOME
1590  PRINT "YOU OVERFLEW THE RUNWAY AT "; INT (VV)
1600  PRINT "MPH AT AN ALTITUDE OF "; INT (ALT)
1610  PRINT "FEET.  TRY AGAIN!!!"
1620  GOTO 20
1630  REM
1640  TEXT : HOME
1650  GOSUB 1850
```

the new velocity 95 percent. This puts lag into the rate at which the velocity can change which tends to simulate the real world. You can change the smoothing constants in lines 140, 160, and 180.

The main subroutine calculates the instrument values and displays them in line 1340. The pitch angle of the aircraft is simulated by variable HR in line 1380 which offsets the view of the runway on the screen. This offset calculation is highly simplified and is a function of the stick only. In a real aircraft the pitch angle is a function of airspeed, throttle, and other variables. You may wish to try a more realistic expression for HR here.

Finally, there are a number of terminating messages. You have "landed" when your altitude is less than AM (line 510). Line 1400 begins the checks of what kind of landing you made (normal or crash). Line 1410 checks if you are short of the runway. Line 1420 assumes it takes ten times your velocity to stop and then line 1430 checks if you flew off the end of the runway. Finally line 1440 checks if you landed too hard. If you get past these checks, lines 1450 through 1470 print the safe landing message. Line 680 checks to see if you have flown off the end of the runway.

Program Modifications

The author has made many variations of this program such as adding instrument approach (where you cannot see the runway until you are very close to it), visual only approach (where the instruments do not work), a visual marker two miles from the runway, a marker which flashes an indicator when the plane is five or a half mile from the runway, and so on. One variation allows you to take off from one runway and land at another. You may want to experiment with such variables as

RW — runway length (4000 feet)
X — starting distance from runway
ALT — starting altitude
V — velocity (make a jet!)

Try changing various constants in expressions for V and DALT (rate of climb). (Do not delete any remarks in the program because some remarks are GOTO targets.)

Sublogic Company (201 W. Springfield Ave., Champaign, IL 61820) has on the market the FS-1 Flight Simulator which is fantastic. It simulates turns, banks, and much more. I highly recommend it if you want to "fly." But since FS-1 is written in assembly language with no listings supplied, you cannot learn much about how it works (although their rather extensive operating manual has block diagrams of the simulator's structure). I started writing my Flying Simulator before I had heard of FS-1, but have to admit I spend more time "flying" FS-1 than my own. Happy landings. □

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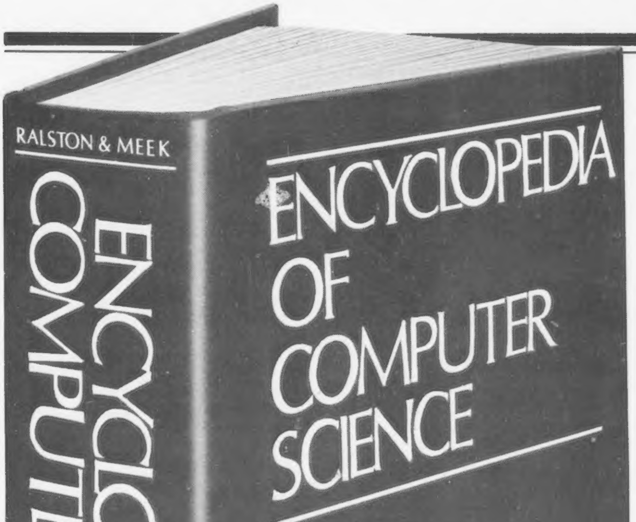
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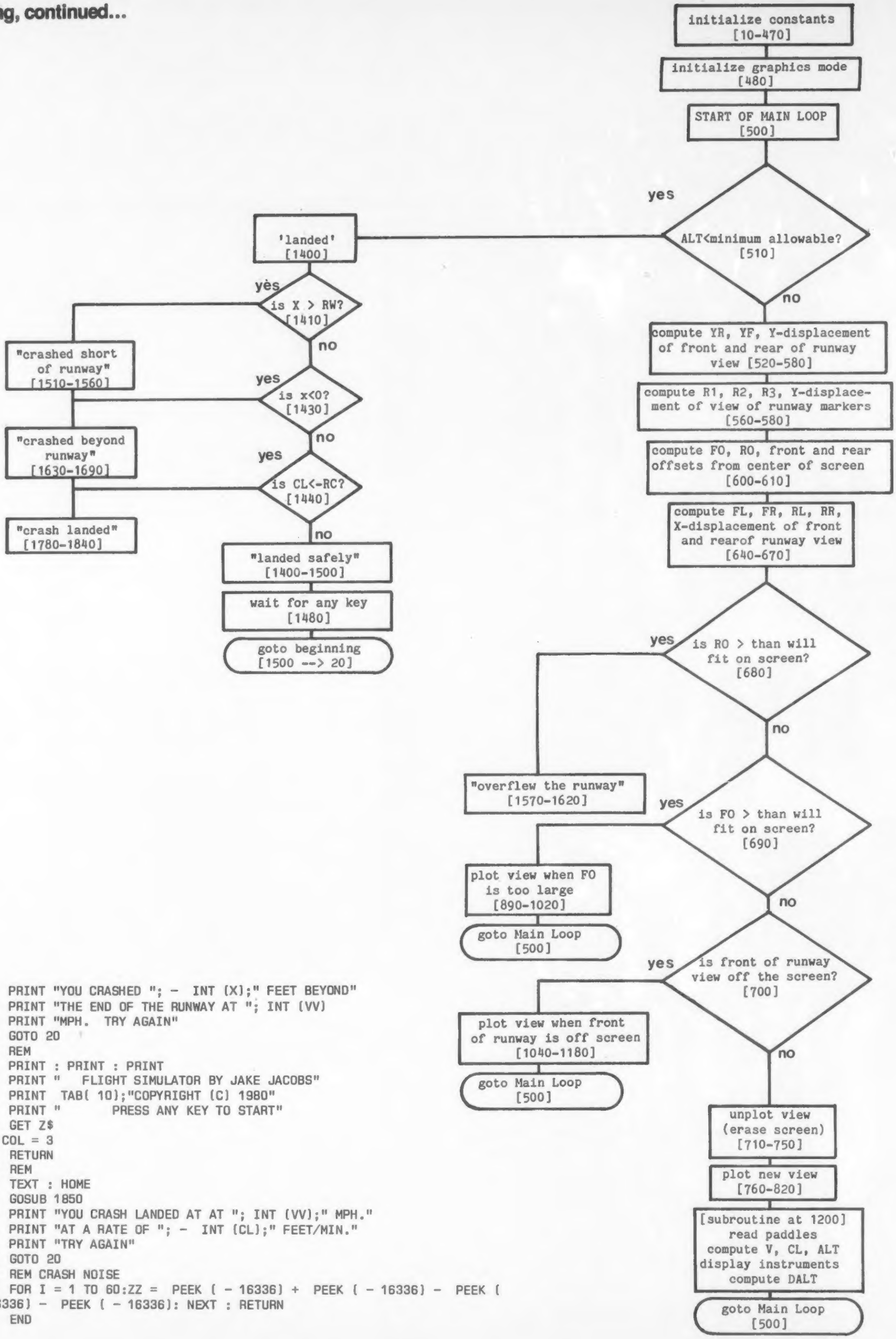
Landing, continued...


initialize constants [10-470]
initialize graphics mode [480]
START OF MAIN LOOP [500]
ALT<minimum allowable? [510]
yes
no
'landed' [1400]
is X > RW? [1410]
yes
no
"crashed short of runway" [1510-1560]
is x<0? [1430]
yes
no
"crashed beyond runway" [1630-1690]
is CL<-RC? [1440]
yes
no
"crash landed" [1780-1840]
"landed safely" [1400-1500]
wait for any key [1480]
goto beginning [1500 --> 20]
compute YR, YF, Y-displacement of front and rear of runway view [520-580]
compute R1, R2, R3, Y-displacement of view of runway markers [560-580]
compute FO, RO, front and rear offsets from center of screen [600-610]
compute FL, FR, RL, RR, X-displacement of front and rearof runway view [640-670]
is RO > than will fit on screen? [680]
yes
no
"overflew the runway" [1570-1620]
is FO > than will fit on screen? [690]
yes
no
plot view when FO is too large [890-1020]
goto Main Loop [500]
is front of runway view off the screen? [700]
yes
no
plot view when front of runway is off screen [1040-1180]
goto Main Loop [500]
unplot view (erase screen) [710-750]
plot new view [760-820]
[subroutine at 1200] read paddles compute V, CL, ALT display instruments compute DALT
goto Main Loop [500]

```
1660  PRINT "YOU CRASHED "; -  INT (X);" FEET BEYOND"
1670  PRINT "THE END OF THE RUNWAY AT "; INT (VV)
1680  PRINT "MPH.  TRY AGAIN"
1690  GOTO 20
1700  REM
1710  PRINT : PRINT : PRINT
1720  PRINT "   FLIGHT SIMULATOR BY JAKE JACOBS"
1730  PRINT  TAB( 10);"COPYRIGHT (C) 1980"
1740  PRINT "          PRESS ANY KEY TO START"
1750  GET Z$
1760 COL = 3
1770  RETURN
1780  REM
1790  TEXT : HOME
1800  GOSUB 1850
1810  PRINT "YOU CRASH LANDED AT AT "; INT (VV);" MPH."
1820  PRINT "AT A RATE OF "; -  INT (CL);" FEET/MIN."
1830  PRINT "TRY AGAIN"
1840  GOTO 20
1850  REM CRASH NOISE
1860  FOR I = 1 TO 60:ZZ =  PEEK ( - 16336) +  PEEK ( - 16336) -  PEEK (
 - 16336) -  PEEK ( - 16336): NEXT : RETURN
1870  END

]
```

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INSIDE THE COLOR COMPUTER: This package is a disassembler which runs on the color computer and enables you to generate your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. Disassembler features include cross-referencing of variables and labels; output code which can be re-assembled; output to an 80-column printer, small printer or screen; and a data table area specification which defaults to the table boundaries in the interpreter ROM. A 16K system is required for the use of this cassette.
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CIRCLE 245 ON READER SERVICE CARD

Compleat Computer Catalogue

COMPUTERS

PORTABLE BUSINESS SYSTEM

Systel Computers, Inc., announces the Report/80, a fully-integrated, portable business computer system priced at less than $10,000.

Designed as a "first" computer system for small businesses, the Report/80 combines two central processing units, memory, keyboard, video display, two mini-floppy diskette drives, dot matrix printer, and two RS-232C ports in a single unit that weighs less than fifty pounds and fits on a standard typewriter table.

The system runs CP/M and Systel offers a selection of integrated business programs including compatible general ledger, accounts receivable, accounts payable, payroll, inventory, purchase order, sales order, word processing, and mailing list programs.

The Report/80 is available in two models, Model 11 and Model 15. Model 11 includes two double-sided, double-density drives, which provide a total of 740 kilobytes of (formatted) storage. $8950. Model 15 includes two double-sided, quad-density drives, which provide twice the capacity: a total of 1.4 megabytes of (formatted) storage. $9950.

Systel Computers, Inc., 20370 Town Center Lane, Cupertino, CA 95014. (408) 253-0992.

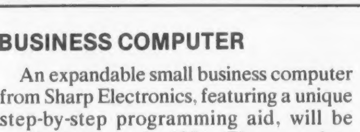
CIRCLE 301 ON READER SERVICE CARD

BUSINESS COMPUTER

An expandable small business computer from Sharp Electronics, featuring a unique step-by-step programming aid, will be available in early 1981. The complete system, designated the Sharp YX-3200 Business Computer, includes a Central Processing Unit, high-resolution CRT display with green characters, dual-drive floppy disk and an impact printer.

According to a company spokesperson, the YX-3200 System was designed with the businessman's needs in mind, but also offers him the abiltiy to expand as his business grows.

The desk-top system, designed with expandable 32K ROM and 64K RAM, features the Automatic Program Generator which poses questions to the user that, when answered design the desired program. Once entered into the unit's Z-80 processor, the program can be stored indefinitely or used at the operator's convenience. The YX-3200 also features extended Basic.



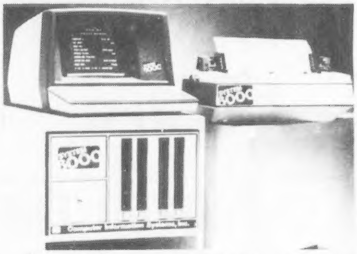
The YX-3200 can accommodate up to 72K ROM and 128K RAM. The Sharp 5½" floppy disk drives—dual-sided, double density—can store up to 285K bytes per diskette. The YX-3200 can accommodate a maximum of eight disk drives.

The high-resoultion 12" CRT display offers upper- and lower-case characters on an 80-column, 24-line screen for a total of 1,920 characters. Another feature of the easy-to-read display is its capability to increase character size for group viewing or dramatic graphic purposes. With this feature in use, the CRT can display up to 40 characters per column on a 15-line display for a total of 600 characters.

The bi-directional, dot-matrix 80-character per second printer offers an 80/132 column per line capability.

CIRCLE 302 ON READER SERVICE CARD

COMPUTER FOR DOCTORS



A practice management computer designed specifically for doctors, the System 6000, has been announced by Computer Information Systems, Inc.

The System 6000's practice management capabilities include receivables aging reports, receivables patient status list, receivables day sheet, patient statements, AMA and Blue Cross/Blue Shield insurance forms, practice analysis reports and patient recall reports.

In addition, the System 6000 handles accounts payable, general ledger/financial statements, payroll, check-writing and word processing. $13,500.

CISI, 20 E. Main St., Mesa, AZ 85201. (602) 834-8958.

CIRCLE 303 ON READER SERVICE CARD

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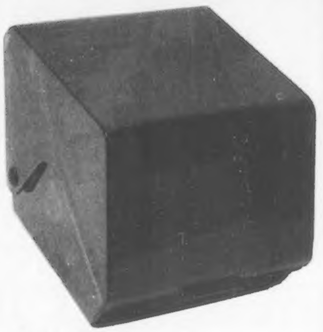

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CIRCLE 228 ON READER SERVICE CARD

The most complex computer circuit can be explained with just nine cents

Common Cents

The "penny switch." It sounds strange. But it's not.

Joe Weisbecker, the designer of the RCA 1802 microcomputer, was trying to explain to some children just how a computer works. He wasn't having much success.

Computers Aren't Magic

Joe's hobby is magic. He thought, "maybe I can use some kind of illusion to show how a computer works." But he didn't really want to use an illusion. He didn't want the children to think of a computer as magic.

So he hit upon the idea of a simple flip-flop switch (the most common circuit in a computer) represented by the head or tail of a penny. This flip-flop circuit uses just one penny. Every time it receives an impulse it changes from head to tail or tail to head. Simple.

But then Joe went on and put two of these simple flip flops together to make a circuit that adds two numbers together. And another that subtracts numbers. Kids loved these circuits and played with them like games.

Games With Pennies

Before long, Joe devised circuits to play more complicated games like Tic Tac Toe, Guess A Number and Create A Pattern. Pretty soon he had 30 circuits (or games) that explained everything about computers from a basic adder to complex error correction. The most complex circuit uses just nine pennies (or dimes for the big spender).

These circuits, each one with a full size playing diagram, have been collected together in a book called *Computer Coin Games*. With this book children or adults can easily understand the workings of even the most complex computer circuits.

Games Magazine said, "whether or not you have any experience with computer technology, you'll be both amazed and delighted with the simplicity of the format and the complexity of the play. All you need is some common cents."

Dr. Dobbs Journal agreed, saying, "*Computer Coin Games* is a simple approach to a complicated concept. The book is liberally sprinkled with clever illustrations and diagrams, and provides a relatively painless route to understanding how computer circuits function."

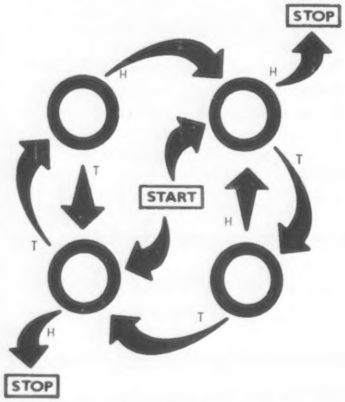
Money back Guarantee

We're convinced that you'll understand the inner workings of a computer after playing these 30 games. If you don't, send the book back and we'll refund the complete price plus your postage to send it back.

To order your copy of *Computer Coin Games*, just send $3.95 plus $2.00 for one, $3.00 for two or more for shipping and handling to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders may be called toll free to 800-631-8112 (in NJ, 201-540-0445).

With its wonderful illustrations by Sunstone Graphics, *Computer Coin Games* makes an ideal gift. *The Association for Educational Data Systems* calls the book "an ideal introduction to the concepts of computer circuitry."

Order your copy today.



"Heads Up Game." Starting with tails in all positions, how many times through to get all four pennies heads up?

creative computing

Morris Plains, NJ 07950
Toll-free **800-631-8112**
(In NJ 201-540-0445)

CIRCLE 350 ON READER SERVICE CARD

ABC-26
abc-26

System features include Ai's original DOSKET-20, CP/M, UCSD Pascal, and a variety of high level languages, including Basic-80, MBasic, Cobol-80, PL/3, Fortran IV, CBasic, Macro ASM and Pascal plus XASM-Z8000, XLoader-Z8000 and XMacro-86.

Ai Electronics Corporration, 2-28-16 Shimomaruko, Ohta-ku, Tokyo 146, Japan.

TERMINALS & I/O

GRAPHICS TERMINAL PACKAGE FOR EDUCATION

Digital Equipment Corporation has introduced its first graphics terminal package designed specifically for the educational marketplace. Called GIGI (for General Imaging Generator and Interpreter), the portable unit is a microprocessor-based "intelligent keyboard" that can be used with user-supplied color or monochrome video monitors.

GIGI provides interactive graphics and incorporates such educational functionalities as an integral graphics instruction set called ReGIS (Remote Graphics Instruction Set).

It has multiple character sets, local intelligence (including a Basic read-only memory implementation), eight-level color and shading support, and a set of educationally oriented application software packages. It has provisions for interfacing either a graphics tablet or a graphics printer.

GIGI and its associated software are supported under the RSTS/E, VAX/VMS, and TOPS-20 operating systems, and extend the capabilities of Digital's interactive educational computer systems based on the PDP-11, VAX-11, and DECSYSTEM-20 computers.

Concurrent with the announcement of the intelligent keyboard, Digital has introduced a receive-only graphics printer for GIGI that provides users with a hard copy of images that appear on the monitor screen. Called the GIGI DECwriter IV Graphics Printer, the unit is a microprocessor-driven printer based on a dot-matrix impact printing technique.

GIGI is available to educational institutions in "5-packs." Each 5-pack includes five GIGIs with associated cables and connectors, one GIGI graphics printer, discount certificates toward additional GIGI units, and a choice of one of two software options. Educational customers can purchase 5-packs at $25,000.

Digital Equipment Corporation, Maynard, MA 01754.

CIRCLE 305 ON READER SERVICE CARD

VOICE ENTRY TERMINAL FOR APPLE

Scott Instruments offers an enhancement to its line of VET/2 Vice Entry Terminals which permits its voice units to interface directly with any 48K Apple II computer.

Measuring 1-¼" by 8" by 10", the VET/2 plugs into any slot in the Apple II and is linked functionally to the keyboard. The direct keyboard link allows the user to choose keyboard input or voice input at any time.

The peripheral is said to allow the user to run Integer Basic, Applesoft and machine-code programs by voice input with no modifications to the programs. $895.

Scott Instruments, 815 North Elm, Denton, TX 76201. (817) 387-9514.

CIRCLE 306 ON READER SERVICE CARD

COMPILERS

ACCEL2: Compiler for TRS-80 Disk BASIC. Compiles selected subset to Z80 machine code in all four variable types, compact 1K run-time component controls interpreter to streamline all other statements and functions. Technique minimises code expansion without impairing huge speedups for true double optimisation. Six diagnostic messages, Local/Global options increase compatibility with subject programs. Output save to Disk, tapes. Professionals note: No royalties on the derived code. It's like having a 100 mhz clock **$88.95**

ACCEL: Compiler for TRS-80 Level II BASIC. Same huge speedups as ACCEL2 but in INTEGER variable type only. Run-time component just 256 bytes, ideal for graphics, games in 16K. Developed in Britain by Southern Software. **44.95**

TSAVE: Writes compiler output to SYSTEM tape **$9.95**

SOFTWARE CPU™

Super STEP: Animated Z80 Programming Models, Disassembler, Single-step/TRACE modes with intelligent RAM Window, 5 user-selectable Windows, single and cumulative instruction times in microseconds, Reference Space, much more. Big booklet, a Z80 Software CPU. 16K Level II TRS-80, TBUG required. No. BL-0 .... **$19.95**

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16K Level II TRS-80, TBUG required. No. BL-1 .... **$24.95**

COLOR COMPUTER

COCOBUG: 6809 Debugging monitor for TRS-80 Color Computer. Examine, modify memory/CPU registers, place breakpoints, execute single instructions or entire machine language programs in real time. Includes 6809 Reference card, runs in 4K. **$19.95**

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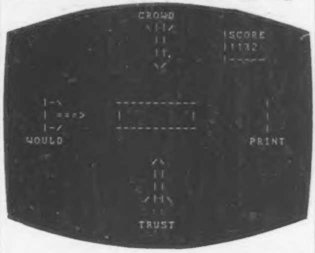
TRS-80, TBUG tm Radio Shack/Tandy Corp.
Software CPU tm Allen Gelder Software.

CIRCLE 108 ON READER SERVICE CARD

MASTERTYPE
A Game That Teaches Typing



Now you can learn to type while playing a game on your APPLE II. In MASTERTYPE, enemy words are attacking your base. You must type the words in order to repel and destroy the attackers. You get to see what you type in the center box, but if you take the time to look at your fingers you will probably be destroyed. Learning to type used to be incredibly dull and boring. MASTERTYPE makes it fun.

The MASTERTYPE diskette comes complete with 17 lessons taking you from simple letters through punctuation marks, plus a program for making your own lessons. To order your copy, send check or money order for $34.95 to:
MASTERTYPE
P.O. Box 5223, Stanford, CA 94305
Specify 13 or 16 sector (16 is default). Requires Applesoft (not the cassette version) and at least 32K.

CIRCLE 178 ON READER SERVICE CARD

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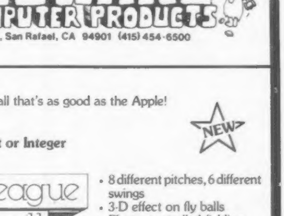

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Apple Pascal Language Card	$ 495	$382
Microsoft Z-80 Card	$ 350	$285
DC Hayes Micromodem II	$ 379	$308
Centronics 737 Printer	$1025	$850

Software Specials

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Apple Plot	$ 70	$ 55
Apple DOS Tool Kit	$ 75	$ 57
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CIRCLE 197 ON READER SERVICE CARD

PERIPHERALS

APPLE INTERFACE

Connecticut microComputer. has introduced APMOD, an interface for Apple microcomputers which allows the processing of real world variables.

With APMOD, an Apple can read temperature, light levels, pressures, and voltages, and can control lamps, motors, pumps, heaters, and appliances. Its purpose is to generate a bus from the Apple. The APMOD plugs into one of the I/O slots of the Apple, providing the necessary port. $49.50

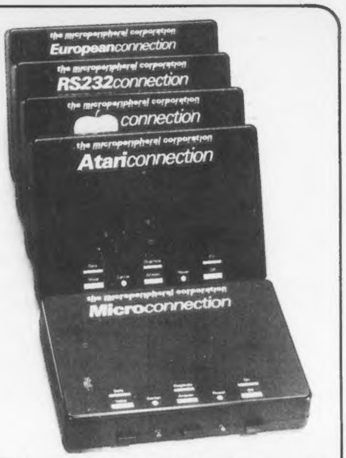
Connecticut microComputer, Inc., 34 Del Mar Dr., Brookfield, CT 06804.

CIRCLE 307 ON READER SERVICE CARD

DIRECT CONNECT MODEM FOR ATARI

The Microperipheral Corporation has announced the Atari Connection, a direct connect modem for interfacing the Atari personal computer to the national telephone network.

The Atari-Connection is Bell 103 compatible and operates in the originate or answer mode at 300 baud. It can be used for accessing The Source, MicroNet, computer bulletin boards and other computers for data transfer with data bases in this country and Europe.


the microperipheral corporation
Europeanconnection
the microperipheral corporation
RS232connection
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Microconnection

The product does not require the Atari Model 850 parallel/serial RS-232C compatible interface unit. The modem is connected in series with the Model 800 computer console data port and the Atari 410 program recorder or disk drive. An RS-232 direct connect modem is available for Atari owners with the interface module. This configuration employs the Atari Telelink cartridge. $249.

The Microperipheral Corporation, 2643 151st Place N.E., Redmond, WA 98052. (206) 881-7544.

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Don't buy a software blackbox! Don't waste thousands of dollars! Educate yourself before you buy!

Report Features:
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CIRCLE 216 ON READER SERVICE CARD

MUSIC SWEETENER

Music Sweetener

Newtech Computer Systems Inc. announces the Music Sweetener, a low-pass filter designed to improve the sound quality of Software Affair's Orchestra-80 and other commercial and homebrew digital-to-analog-converter music synthesizers that do not already incorporate a filter into their design. $39.95

Newtech Computer Systems Inc., 230 Clinton St., Brooklyn, NY 11201. (212) 625-6220.

CIRCLE 309 ON READER SERVICE CARD

6809 PROCESSOR FOR APPLE

Stellation Two announces The Mill, a plug-in processor board for the Apple computer. Installed in any Apple periferal slot, The Mill is said to supercharge the computer with the Motorola 6809E processor, a high speed device optimized for real time data acquisition, stack type languages such as Forth and Pascal, and concurrent programming tasks.

Users may run existing 6502 programs or use software developed for the Motorola 6800 processor: the assembler for The Mill's 6809 will compile 6800 instructions into 6809 object code. $275.

Stellation Two, P.O. Box 2342, Santa Barbara, CA 93120.

CIRCLE 310 ON READER SERVICE CARD

LIGHT PEN FOR OSI

A deluxe version of the L.C.S. Light Pen Kit designed for Ohio Scientific computers is now available. Its features include coiled cord and Kwik-Disconnect plug. $29.95.

Faragher Associates, Inc., 7635 West Bluemound Rd., Milwaukee, WI 53213. (800) 558-0870.

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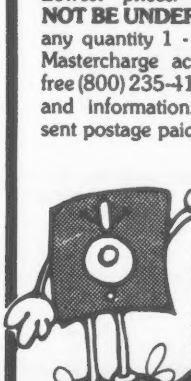

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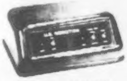
Direct connection to phone lines via RJ11C standard extension phone jack



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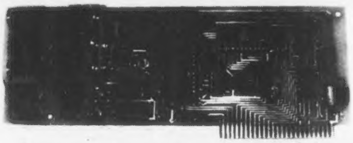
Oasis Systems, 2765 Reynard Way, San Diego, CA 92103. (714) 291-9489.

CIRCLE 312 ON READER SERVICE CARD

CALENDAR/CLOCK FOR APPLE

The IDS Calendar/Clock Card for Apple II provides automatic real-time calendar/clock capability to document events, reports, transactions, appontments, etc.

The card comes equipped with a 2708 ROM chip. No additional programming is necessary. However, a 2716 ROM chip is available which will provide over 2000 bytes of user ROM for additional resident programs. Multiple interrupts can be selected to facilitate specific user functions.



Output information includes: hour, minute, second, AM/PM, day, month, date, and year. Output formats include both standard and military designators. Price Calendar/Clock card is $215. for cards equipped with 2708 ROM chips and $250. for cards equipped with 2716 ROM chips.

Instructional Development Systems, 2927 Virginia Beach Blvd, Virginia Beach, VA 23452. (804) 340-1977.

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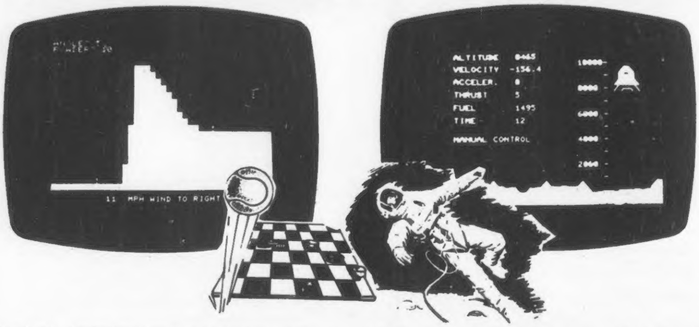

Pie Lob. Splatter your opponent with pie filling by choosing the correct angle and strength of your throw over a computer-generated hill.

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CIRCLE 300 ON READER SERVICE CARD

SYSTEMS SOFTWARE

LANGUAGES

Tiny c associates announces **tiny c two**, a new compiler version of the tiny c structured programming language. New features include 32-bit integers, new operators and redirectable and direct access input/output. The product is initially available in CP/M for the 8080 on 8" single density disks. $250. Tiny c associates, Box 269, Holmdel, NJ 07733.

CIRCLE 314 ON READER SERVICE CARD

BaZic is a software package which is said to allow the North Star Horizon to execute programs 25% to 30% faster. It is available for North Star double density/quad capacity systems on 5 1/4" disk. $150. Micro Mike's, 905 South Buchanan, Amarillo, TX 79101. (806) 372-3533.

CIRCLE 315 ON READER SERVICE CARD

Abacus Software has announced **Tiny Pascal Plus**, an enhanced version of Tiny Pascal which features support for graphics. It is available for the 32K PET or Apple. $50. Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510.

CIRCLE 316 ON READER SERVICE CARD

Paratronics Computer Services offer **English** for use with its Servant 3.2. system. It is available for the TRS-80 Model I and Model II, North Star and Apple II. $49.95. Paratronics Computer Services, 2938 Beverly Glen Cir., Los Angeles, CA 90024.

CIRCLE 317 ON READER SERVICE CARD

Fortran and **Cobol** are now available for the Apple computer. Both languages, which run under the CP/M operating system, are designed to be used with Microsoft's SoftCard on a 48K Apple. The Cobol-80 package includes the Cobol-80 compiler, Link-80 linking loader, Macro-80 macro assembler, Lib library manager, Cref-80 cross reference assembler and reference documentation. $750. The Fortran-80 package includes the Fortran-80 compiler, Link-80 linking loader and reference manual. $195. Microsoft Consumer Products, 400 108th Ave., NE, Suite 200, Bellevue, WA 98004. (206) 454-1315.

CIRCLE 318 ON READER SERVICE CARD

TForth, a Fig-Standard version of Forth, is now available for the TRS-80. It contains built-in operating system, assembler, text editor, floating point math package, I/O package, phoneme assembler (support for voice synthesizer) and graphics links into RS routines. $130. Sirius Systems, 7528 Oak Ridge Hwy., Knoxville, TN 37921. (615) 693-6583.

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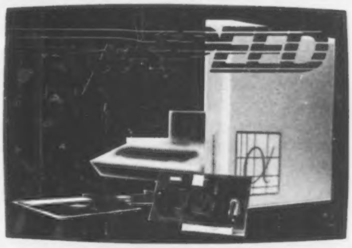
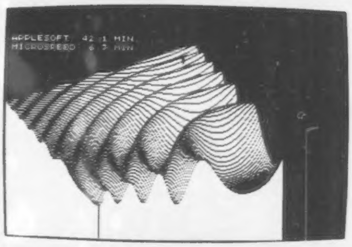
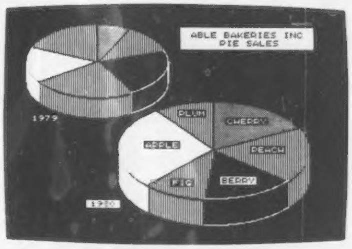
FOR THE APPLE :







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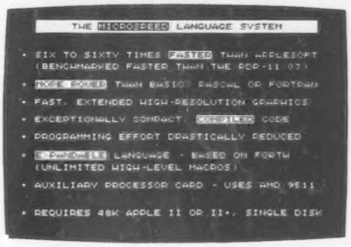

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SYSTEMS

Disk Zap 2.3 is an editor for the TRS-80 Model I equipped with the Percom Doubler that will work with either single or double density disks. It is track and sector oriented, offers access to all parts of the disk, and has the ability to format and back up disks as well as edit them. $19.95. Micro-Systems Software, Inc., 5846 Funston St., Hollywood, FL 33023. (305) 983-3390.

CIRCLE 320 ON READER SERVICE CARD

EDAS 3.4 is a text editor and assembler for the TRS-80 Models I and III. It provides text editing facilities for the modification of alpha-numeric text files in RAM, as well as text block move, global change with line range directive, string search, and line scroll capabilities. $75. Serious Software, 5904 Edgehill Dr., Alexandria, VA 22303. (703) 960-2998.

CIRCLE 321 ON READER SERVICE CARD

Prism integrates the features of a data base management system with those of a program development system. This is said to enable users to develop applications such as mail lists, patient records or real estate listings without programming. Prism runs on computers using CP/M and CBasic-2 with 48K memory and two or more disk drives. Micro Applications Group, 7300 Caldus Ave., Van Nuys, CA 91406. (213) 881-8076.

CIRCLE 322 ON READER SERVICE CARD

HEXDOS 2.3 for OSI systems is designed for use with ROM Basic and supports such features as real-time clock, named disk files, trace and single-stepping of programs, tone generator, multiple data files, editing capabilities and chaining of programs. $27.50. The 6502 Program Exchange, 2920 West Moana, Reno, NV 89509.

CIRCLE 323 ON READER SERVICE CARD

Textan is a multi-faceted, machine language editor designed to operate on the TRS-80 with at least 16K of memory. It is video-oriented, and reads program tapes written in Level II Basic and returns to Basic with the program fully loaded upon completion of the edit function. Features include 32 command functions and 26 reserved word keys $40. Southeastern Software, 512 Conway Lane, Birmingham, AL 35210. (205) 956-2389.

CIRCLE 324 ON READER SERVICE CARD

Lifeboat Associates announces **CP/M 2** for Ohio Scientific C3 computers. The system includes CP/M disk-to-disk copy routine, a memory test program for the Z80 and I/O drives for all common OSI peripheral devices. $200. Lifeboat Associates, 1651 Third Ave., New York, NY 10028. (212) 860-0300.

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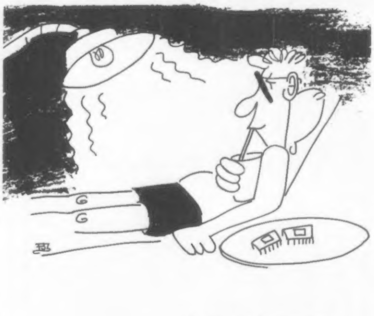

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All programs written in CBASIC under CP/M and compatible with TRS-80II. For additional information please contact:

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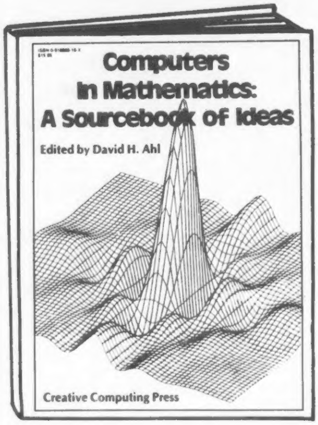
CIRCLE 179 ON READER SERVICE CARD

Sourcebook of Ideas

Many mathematics ideas can be better illustrated with a computer than with a text book.



Consider Baseball cards. If there are 50 cards in a set, how many packs of bubble gum must be purchased to obtain a complete set of players? Many students will guess over 1 million packs yet on average it's only 329.

The formula to solve this problem is not easy. The computer simulation is. Yet you as a teacher probably don't have time to devise programs to illustrate concepts like this.

Between grades 1 and 12 there are 142 mathematical concepts in which the computer can play an important role. Things like arithmetic practice, X-Y coordinates, proving geometic theorems, probability, compounding and computation of pi by inscribed polygons.

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The National Council of Teachers of Mathematics has strongly endorsed the use of computers in the classroom. Unfortunately most textbooks have not yet responded to this endorsement and do not include programs or computer teaching techniques. You probably don't have the time to develop all these ideas either. What to do?

For the past six years, *Creative Computing* magazine has been running two or three articles per issue written by math teachers. These are classroom proven, tested ideas complete with flowcharts, programs and sample runs.

Teachers have been ordering back issues with those applications for years. However, many of these issues are now sold out or in very short supply.

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The book includes many activities that don't require a computer. And if you're considering expanding your computer facilities, you'll find a section on how to select a computer complete with an invaluable microcomputer comparison chart.

Another section presents over 250 problems, puzzles, and programming ideas, more than are found in most "problem collection" books.

Computers in Mathematics: A Sourcebook of Ideas is edited by David Ahl, one of the pioneers in computer education and the founder of *Creative Computing.*

The book is not cheap. It costs $15.95. However if you were to order just half of the back issues from which articles were drawn, they would cost you over $30.

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CIRCLE 326 ON READER SERVICE CARD

Strategic Simulations has recently released three war games on disk for the 48K Apple II. **Computer Conflict** consists of two introductory games, Rebel Force, in which the player commands a Soviet regiment which must re-take a vital town overrun by a computer-directed uprising, and Red Attack, a two-player game that simulates an invasion by a mixed Soviet tank and infantry force against a defending battalion. $39.95. **Computer Air Combat** is an advance game of World War II aerial combat. $59.95. In the **Warp Factor**, one or two players command starships in scenarios that range from space skirmishes to full-scale star wars. $39.95. Strategic Simulations, Inc., 465 Fairchild Dr., Suite 108, Mountain View, CA 94043. (415) 964-1353.

CIRCLE 327 ON READER SERVICE CARD

Asteron is a version of "Asteroids" featuring hi-res graphics for single player or tournament play ($27.50). **Star Avenger** is a real time space strategy game which pits the player against the computer ($27.50). All games are written in machine language for the 48K Apple with disk drive. Western MicroData Enterprises, Ltd., P.O. Box G33, Postal Station G, Calgary, Alberta, Canada, T3A 2G1.

CIRCLE 328 ON READER SERVICE CARD

The Wizard is a question and answer game designed to test the wisdom of up to four players in four pre-programmed categories using the TRS-80 Model I. A built-in utility program allows the user to feed in his own data base in any area of expertise. Programs Unlimited, 125 South Service Rd., Jericho, NY 11753. (516) 997-8668.

CIRCLE 329 ON READER SERVICE CARD

The Prisoner consist of 20 interlinked games on one disk for the 48K Apple. The program places the player on an island which houses a psychological prison camp, and challenges him to escape. $29.95. Edu-Ware Services, Inc., 22035 Burbank Blvd., #223, Woodland Hills, CA 91367. (213) 346-6783.

CIRCLE 330 ON READER SERVICE CARD

EDUCATIONAL

The first of a planned series of microcomputer **educational programs** is geared to practical day-to-day living situations. Included in the series are: Poison-proof your home, Income meets expenses, You can bank on it, Home safe home, Money management assessment series and Job readiness assessment and development. The programs are available for 48K Apple with Applesoft and disk drive, and TRS-80 Model I, 16K Level II with cassette. They contain four to eight disks or cassettes and range in price from $125 to $340. Interpretive Education, Dept. NR, 2306 Winters Dr., Kalamazoo, MI 49002. (616) 345-8681.

CIRCLE 331 ON READER SERVICE CARD

Microsoft has announced an Applesoft version of **Typing Tutor**, the software package designed both to teach typing and to build typing speed through individualized lessons and drills. The new version requires an Apple II or Apple II Plus, Applesoft, 32K RAM and one disk drive. $19.95. Microsoft Consumer Products, 400 108th Ave., NE, Suite 200, Bellevue, WA 98004. (206) 454-1315.

CIRCLE 332 ON READER SERVICE CARD

Words for the Wise is a spelling tutor system for the elementary school student. It features five spelling activities, including Missing Letters, Scrambled Words, Match the Letters, Alphabetizing and Hangman, and is written for the TRS-80 16K Level II. $14.95. TYC Software, 40 Stuyvesant Manor, Geneseo, NY 14454.

CIRCLE 333 ON READER SERVICE CARD

Educational Programs announces two programs for the TRS-80 which are designed to develop mathematical reasoning and teach important mathematical concepts. The **Estimation Game** develops number sense and estimation in computation with whole numbers. The **Distance Game** provides experience with two- and three-dimensional graphing by locating a point using distance information. $9.95. Educational Programs, Box 2345, West Lafayette, IN 47906.

CIRCLE 334 ON READER SERVICE CARD

Instructional Development Systems announces **Assisted Instructional Development System**, a curriculum authoring system designed to allow an educator who has no programming knowledge to create lessons or curricula with a 48K Apple II with single disk drive. Lessons may contain multiple screen pages of instructional text, multiple correct answers and replies, multiple incorrect answers and replies, unexpected replies and failure messages. The system also maintains records on student performance and equipment use. $495. Instructional Development Systems, 2927 Virginia Beach Blvd., Virginia Beach, VA 23452. (804) 340-1977.

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Compu-Spell for the 48K Apple with disk drive is designed to teach spelling skills to children in grades 4 through 8. It features an additional unit aimed at the adult user, as well as upper and lower case display and a file management system for monitoring progress. $39.95. Edu-Ware Services, Inc., 22035 Burbank Blvd., #223, Woodland Hills, CA 91367. (213) 346-6783.

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Phase 1 of the **Basic English Skills** Series consists of 25 lessons which focus on the functional identification and use of five parts of speech: nouns, pronouns, adjectives, adverbs and verbs. Lessons may be used as part of regular reinforcement practice sessions as well as to expand or establish remedial instruction programs. The package requires a 48K Apple II Plus with disk drive and ROM+ with keyboard filter. Convergent Systems, 245 East Sixth St., Suite 257, St. Paul, MN 55101.

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Scribewriter IX Word Processing System provides on-screen formatting of printed text, complete with all spacing, titles, page numbering, centering and justification. Among the features offered is Auto-Insert which allows the user to print letters based on the use of standard paragraphs or based on the use of mailing lists which are created directly as Scribewriter files, or both. The program is available on a single-sided, 5 1/4" disk in North Star format. $200. Friedman Ads/Promotions, P.O. Box 234, Shiba, Tokyo, Japan, 105-91.

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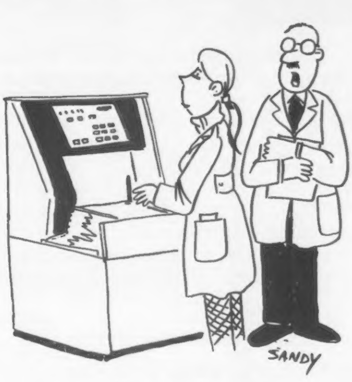

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Astronomy Package for 8K Atari or PET is a Basic language program which allows the user to predict the location of any celestial object at any time. $6. Kinetic Designs, 401 Monument Rd., #171, Jacksonville, FL 32211.

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Genealogy—Compiling Roots and Branches is designed to allow the user to build information on his family tree and to output that information in several ways. It runs on the TRS-80 Model II with one disk drive and 64K RAM plus an 80-column printer. $250. John J. Armstrong, 3700 Whispering Pine Rd., #47B, Mobile, AL 36608.

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MUSIC & GRAPHICS

Plot and Draw is a graphic editor for the Atari, which allows the user to generate and save graphics in three colors plus a background. It is available on 8K cassette and requires a joystick. $18. Mosaic Electronics, Box 748, Oregon City, OR 97045.

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TellStar is a high resolution graphics program which responds interactively with the user via text and joystick or game paddles to locate, identify and provide information on stellar objects. The program is designed for Apple computers with 48K memory, Applesoft firmware card and one disk drive. $39.95. Information Unlimited Software, 281 Arlington Ave., Berkeley, CA 94707. (415) 525-9452.

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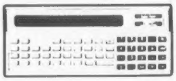
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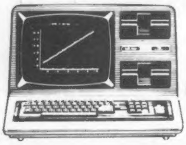
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Graham-Dorian Software Systems introduces **UltraSort**, an assembly language program that stands alone or incorporates into existing CBasic-2 progrrams. Sorting may be done alphabetically, numerically, in ascending or descending order, and can start anywhere in a file. Graham-Dorian Software Systems, Inc., 211 N. Broadway, Wichita, KS 67202. (316) 265-8633.

CIRCLE 347 ON READER SERVICE CARD

Datacomm is a data communications software package for use with Hayes Micromodem II- or Pascal-equipped Apple II computers. The package consists of a disk and Pascal owner's manual which includes two levels of program commands: the Datacomm Terminal Program, which allows Pascal users to exchange data and programs; and the Pascal Micromodem II Routines, which permit the more advanced programmer to include data communications commands in original Pascal programs. $50. Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092. (404) 449-8791.

CIRCLE 348 ON READER SERVICE CARD

Pascal Utility Express Package, a package of utilities and other software for the Apple, is designed to help users with some programming experience in Basic to get acquainted with UCSD Pascal. $45. Software Express, P.O. Box 50453, Palo Alto, CA 94303. (415) 856-9244.

CIRCLE 349 ON READER SERVICE CARD

VU#3 allows Apple users to enter data into Visicalc from any program by inserting data into an array. The program then places the array into Visicalc. It will also transfer data generated by Visicalc into another program. Progressive Software, P.O. Box 273, Plymouth Meeting, PA 19462.

CIRCLE 351 ON READER SERVICE CARD

Stem is a terminal emulator for connecting an Apple to any mainframe computer at up to 1200 bits per second. Features include a switch to print all data as received or entered, conversion of lower to upper case, discard of unused control codes, single key Break and auto restart. $15 on tape or disk. Video Business Systems, 59 Noyes St., Concord, NH 03301. (603) 228-0606.

CIRCLE 352 ON READER SERVICE CARD

Omniterm is an intelligent terminal program designed to allow a TRS-80 to communicate with and transfer files to almost any computer system without writing any special software on the remote computer. The program runs on a 32K TRS-80 with one disk drive and RS-232 interface. $95. Lindbergh Systems, 49 Beechmont St., Worcester, MA 01609. (617) 799-2217.

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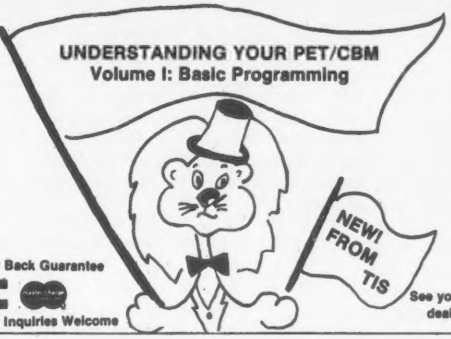

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CIRCLE 259 ON READER SERVICE CARD

Software Legal Forum

The comments and opinions of the author are given for educational purposes only and are not meant to be legal advice. Specific legal questions should be referred to your personal attorney.

Harold Novick

In the "Input/Output" column of the November, 1980 issue of *Creative Computing* magazine, Barry Bayer observed that "I have seen little from you or your magazine with respect to protection of software consumers." Yes Barry, there is a Santa Claus for software consumers too! In fact, this year Santa Claus even visited those horrible, nasty software producing critters. He gave them a new law that specifically states that computer programs can be copyrighted.

First, however, back to Mr. Bayer's problem. The history of the column started when Dave Ahl approached this columnist in one of his many tizzies complaining bitterly about the rip-off artists that were giving personal computerists a bad name and taking money out of the pockets of the poor software developers and producers. Dave wanted a Forum to discuss these and other problems, and it just takes a lot of words to cover them adequately, and still make it enjoyable reading. So the column was born to give an outlet to frustrated software producers (and lawyers!). You can see that time, space, and oiling the squeaky wheel demanded that the area of non-squeaking software consumer protection be left for later times.

Unfortunatly, Barry, most of your letter is merely a lament about the inability to evaluate software before purchasing it and about the manufacturer's broad disclaimers of warranty. You never mentioned one actual legal problem that you had. Therefore, I suggest you put your investigative mind and abilities to work and use your new wordy word processing program to write something that can be published and discussed in the "Forum." However, you do deserve a Thank You for providing part of this month's topic, and next month's, and the month after that, and ...

The area of software consumer protection, like the area of software producer protection, is extremely involved and complicated. This month's column can only broadly discuss the legal ramifications.

A discussion about software consumer protection involves a discussion about whether software is a "service" or "goods." For example, if you go to the hospital and get a blood transfusion or go to the hair dresser and get a hair color transformation, have you purchased a service that only incidentally uses goods or have you purchased goods (blood and hair dye) that only incidentally has an accompanying service. The distinction is far from being theoretical or esoteric. If it is goods, you are in court and you can enforce your well known rights under the Uniform Commercial Code (individually enacted by 49 states, the Virgin Islands and the District of Columbia—sorry Louisiana). What if it is services? Sorry, but that body of law does not apply. (So what are blood and dye—some states say services, some say goods, some don't say.)

The next discussion involves whether there is a "consumer." While a company purchasing an accounting package is clearly not a consumer, what about an unincorporated part-time consultant? What about the sibling of a consumer who purchased the software? Do the protections that would flow to the purchaser continue downstream to the user? Sometimes. But, only sometimes.

There should also be a discussion of the myriad laws that apply and of agencies that stand (sit?) ready to help. The Federal government has passed the Federal Trade Commssion Act, the Consumer Product Safety Act, and the Magnuson-Moss Warranty Act. As mentioned above, most states have passed the Uniform Commercial Code and some have also passed special consumer laws relating to warranty disclaimers.

All of the states have a form of the "Common Law," or judge-made law, through which certain rights can be obtained. If the software causes an injury, there are the tort common laws of negligence, strict products liability, and malpractice. If the software produces a disagreement, then there is the contract common law for obtaining redress.

Some of these laws have placed the burden on the software producer to provide a product: that will do what the producer specifically says it will do (implied warranty of fitness for particular purpose); that the producers owns and can sell (implied warranty of title); that is free from any adverse patent or copyright claims (implied warranty of non-infringement); and that is commercially acceptable and salable (implied warranty of merchantability). Some of the laws address what damages can and cannot be recovered. Surprisingly for some, a software producer is not an insurer and just because something goes wrong does not mean one can collect any or all the losses. For example, assume you purchase some $100 graphics software to perform a $100,000 contract you have just won. The next bidder's price was $125,000. The software does not work and you have to pay the additional $25,000 to have the other company perform the contract. The software provider is only liable for $100. There is some difference between $100 and $25,000; but that's the law!

The practical resolution of software consumer problems usually resides outside the courtroom in *tete-a-tete* bargaining with the software producer. If you deal with reputable computer stores (instead of Fanny's five-finger, midnight discount), you can usually not only see the software work before you buy it, you can also usually get a satisfactory resolution of any difficulties.

Harold Novick, Patent Attorney, Larson & Taylor, Arlington, VA 22202.

The other leg of this month's bifurcated column deals with copyright protection of computer software. No Virginia (or Barry or whoever), before December, Kris Kringle never guaranteed that software was copyrightable. Even if it were copyrightable, it was not clear whether transferring the program from a floppy disk to the active computer memory was "copy" and was permissible. As of December 12, 1980, all of that has been changed. On that date the President signed into law a bill to "amend the patent and trademark laws," which also amended the Copyright Act of 1976.

The amendment to the Copyright Act added the following definition of a computer program:

"A 'computer program' is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result."

Section 117 of the Act has also been replaced with the following limitation on the exclusive rights obtained from a copyright (i.e., Section 106):

"Notwithstanding the provisions of section 106, it is not an infringement for the owner of a copy of a computer program to make or authorize the making of another copy or adaptation of that computer program provided:

"(1) that such a new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other mannner, or

"(2) that such new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful.

"Any exact copies prepared in accordance with the provisions of the section may be leased, sold, or otherwise transferred, along with the copy from which such copies were prepared, only as part of the lease, sale, or other transfer of all rights in the program. Adaptation so prepared may be transferred only with the authorization of the copyright owner."

With one minor change, the new copyright law as passed is identical to the change proposed by the National Commission on New Technological Uses of Copyrighted Works (CONTU). CONTU was created by Congress to study the old and new copyright laws, and to propose changes in the new law regarding "copyrighted works used in conjunction with computer and machine duplication systems."

According to CONTU, the new computer program amendments to the Copyright Act of 1976 "make it explicit that computer programs, to the extent that they embody an author's original creation, are proper subject matter of copyright." In addition, the law now applies to *all* computer uses of copyrighted programs and "the rightful possessors (changed to 'owners' by Congress) of copies of computer programs may use or adapt these copies for their use."

These changes should completely wipe the slate clean of the debris from the Compuchess decision (See the Dec. 1980 "Forum"). As readers of the "Forum" know, the lower court judge in that case ruled that a ROM is *not* a "copy" of a computer program and is not covered under the new act. This now is no longer the law and thus is no longer a problem. Software producers can market their programs in any form they choose. Software producers can now celebrate and rest easier.

As the pronouncements from the Supreme Court relating to the patentability of software are being awaited, this column will continue to delve deeper into the copyright protection of computer programs (for example, into the copyrightability of computer programs written by other computer programs) and into the warranty problem for software consumers. ☐

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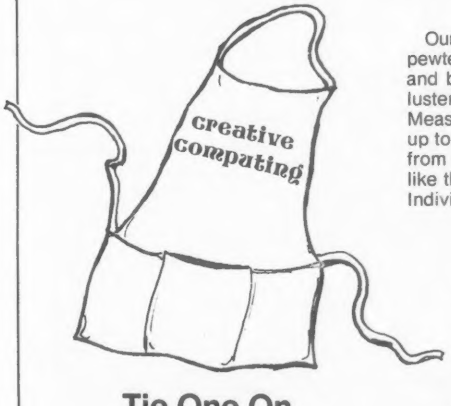

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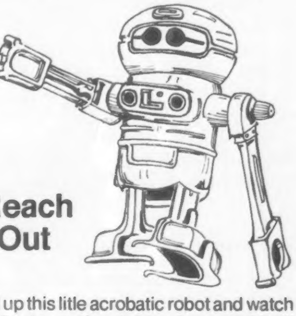

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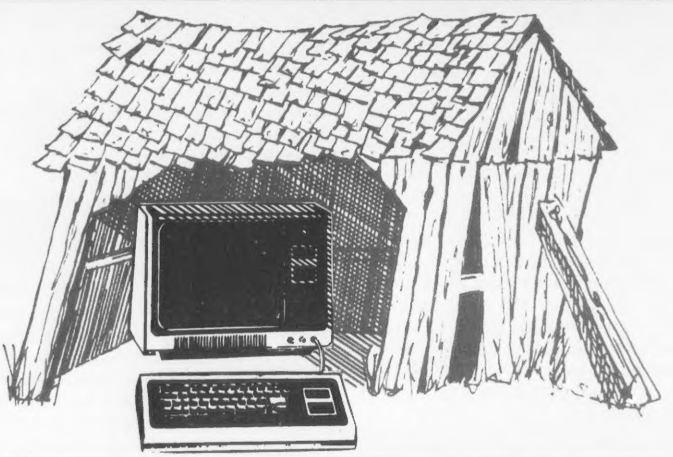

For the 28th column, we mourn the death of the Model I, look at Microsoft's Level III Basic, examine six Hayden programs, and check out a short program that creates "wallpaper" graphics.

Death of Model I

To introduce the three new TRS-80 computers in the November 1980 column (p 182), I used the subhead "Now We Are Five."

Had I known early enough what was happening, the December column might have included a piece called "Now We Are Four," because, as you probably know by now, Radio Shack stopped production of the Model I computers, both Level I and Level II, well before the end of 1980.

The reason is quite simple: Radio Shack couldn't sell the Model I computers after January 1, 1981, because of their excessive high-frequency radiation, which causes, among other things, heavy "snow" on nearby TV screens.

The Model III is a complete redesign of the Model I computers so as to, among other things, comply with FCC regulations, by using filters, shielding, a groundplane, etc.

Radio Shack thought there were enough of the Model I computers on hand until the Model III would be available, but couldn't deliver the III in time, so there was a gap. One dealer told me, "We haven't been able to get any Model I computers from the warehouse since the middle of November."

The death of Model I came as no surprise to those of you who are familiar with the FCC regulations, and who took a close look at the specifications of the Model III and the Color Computer.

Model III Basic, by the way, is *not* Microsoft's Level III Basic.

Level III Basic

Because the Level II TRS-80 can address only 12K bytes of ROM memory, Radio Shack had to remove several features from Microsoft's Basic to make it fit.

If you have a 16K Level II TRS-80, now you can have all of the original Microsoft Basic, called Level III Basic, recorded in both cassette and disk versions on one cassette, at $49.95.

Look for it at your local computer shop. Or, for an additional $2.50 for postage and handling, you can get it from Microsoft Consumer Products, 10800 Northeast Eighth, Suite 819, Bellevue, WA 98004.

The first version of Level III Basic was written by Bill Gates when he was 19, and it became the basis for founding Microsoft in 1974. Bill Gates is president of the company, whose Basic is now in the TRS-80, Commodore PET, Apple II, NCR 7200, Compucolor II, OSI and many others.

Although Level III Basic itself can be stored and retrieved from disk, programs generated with Level III have to be stored and retrieved from cassette tape, not disk. You do not have access to disk-storage commands while in Level II Basic.

Three features of Level III Basic can be used only if you have the expansion interface: a built-in digital clock/calendar, output to RS-232 port, and a command for turning the system clock on and off.

After you load the machine-language Level III Basic, just write your program and RUN. But first you should know what new features Level III has that Level II doesn't.

Abbreviated Entries

Level III Basic has 26 abbreviated entries that you use just by pressing SHIFT and one of the letter keys A through Z. Just in case you don't have a list of the 26 nearby while you're programming, you can call it up with LSET LIST and ENTER. This tells you that, in SHIFT mode, A is AUTO, C is ELSE, G is GOSUB, N is NEXT, W is LEFT$(, etc.

This makes program-writing much faster. You can create your own abbreviated entries, by changing any of the 26 to your own.

Automatic Program Renumbering

Using the NAME command, you can renumber program lines, either for an entire program, or from a particular line number to the end of the program.

NAME also changes all line-number references following statements such as GOTO, GOSUB, THEN, ELSE, etc.

Full Error Messages

Whereas Level II Basic prints abbreviations of errors, such as NF, SN, RG, etc., Level III prints the complete error message: NEXT without FOR, Syntax error, Return without GOSUB, etc.

Advanced Computer Graphics

In Level III Basic, you can draw a line between any two locations on the screen in both character mode (16 by 64) and graphics mode (48 by 128).

To draw a line in graphics mode between points (34,15) and (110,36), just use:

```
10 LINE(34,15)-(110,38),SET
```

and to erase the line, change SET to RESET.

To draw a box with those two points as top-left and bottom-right corners, add B to the line:

```
10 LINE(34,15)-(110,38),SET,B
```

and to erase the rectangle, again change the SET to RESET.

To fill in that rectangle with graphics blocks, add an F at the end:

```
10 LINE(34,15)-(110,38),SET,BF
```

and once more, to erase the solid box, change SET to RESET.

In character mode, you can't use SET or RESET. Instead, you generate lines of printing characters or graphics symbols.

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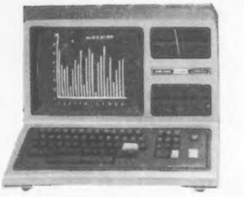

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CIRCLE 161 ON READER SERVICE CARD

TRS-80 Strings, continued...

By using BF, you can fill in the rectangle with alphanumerics or symbols.

Using GET, a specified section of the display can be stored in an array in memory, and retrieved, using PUT, to place the array back on the screen in any specified location.

When you PUT in graphics mode, an "action indicator" is required in the statement. SET puts the array on the screen as it was saved, RESET puts the complement of the array on the screen, AND will AND each position in the array with the current status of that position on the screen, OR is similar to AND, and so is XOR (exclusive OR).

Thus you can make a figure appear to blink by PUTting it on the screen with two PUT statements that alternate SET and RESET, or by XORing it with the surrounding area.

The 77-page booklet that accompanies the Level III cassette includes nine pages of graphics programs that illustrate the features mentioned here, including a space ship, an airplane, and a flying duck.

There's nothing you can do with Level III graphics that you can't do with Level II graphics, but Level III makes it much easier to do and also uses less memory.

From Disk Basic

Among the Level III features borrowed from Disk Basic are the use of #LEN to impose a limit on the length of time allowed before a response must be given to an INPUT statement; replacing a portion of one string with another string, by using an additional capability of MID$; searching a string for a substring using INSTR; and up to 10 machine-language user routines with USR.

Expansion Interface Features

Using TIME$, Level II provides a string that keeps track of date and time. With CMD"T" and CMD"R", the clock can be turned off and then back on again, for certain tape operations.

Lastly, in Level III Basic you'll find that keyboard bounce has been corrected with firmware, so your keyboard will no longer generate NEXXT or FFOR.

Level III contains all the other features of Level II, including transcendentals, and trig and string functions.

All in all, Level III Basic provides extra features well worth the $49.95, to anybody interested in getting all the Basic he (or she) can out of a 16K Level II TRS-80. It comes neatly boxed, with a booklet of instructions and a 16-page fold-out reference card.

Hayden Software

Let's take a look at six 16K Level II program tapes from Hayden Book Co. Some are fairly new, some not so new.

Keynote

An interesting program by John D. Way of Microflair Associates is Keynote, a music-making tape, $9.95 at your local computer store or from the Sales Dept., Hayden Book Co. Inc., 50 Essex St., Rochelle Park, NJ 07662.

Keynote is very much like Radio Shack's Micro Music program. Both are $9.95, both are monophonic (only one note can be played at a time), both cover five octaves, both use the standard letter names for the notes (C,D,E, etc., rather than arbitrary numbers), both use # for the sharp sign and - for flats, and both indicate a dotted note by putting a period after the note.

But whereas Micro Music uses upward and downward arrows to shift to the next higher or lower octave, Keynote numbers the octaves from 1 to 5, so a quarter-note middle C is designated as C3Q. Keynote uses the letters W, H, Q, E, S and T for note values from a whole note to a 32nd, whereas Micro Music uses only 2, 4, and 8 for half, quarter and eighth notes (the absence of a preceding number means a whole note). Also, Micro Music can be played on either Level I or Level II machines.

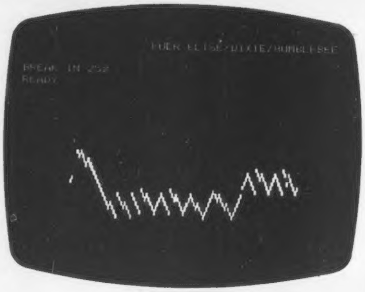
Micro Music includes one sample tune, Rimsky-Korsakov's *Flight of the Bumblebee.* Keynote includes three: the same bumblebee piece, Beethoven's *Fuer Elise,* and *Dixie.* That last tune is played in a marvelous way that shows how much can be done with monophonic music; it sounds as though originally written for the bagpipe, and is so intricately done that at times you'd swear you're hearing two instruments played simultaneously.

Up to this point the two programs are almost equal, and the manuals are both skimpy, although Micro Music's is a little better.

But Keynote contains an ingenious feature that Micro Music doesn't: when played, the three sample tunes, and any you write, are displayed graphically on the screen, by graphics blocks in a pattern that closely resembles the written notes, without the staff lines. This display has no musical purpose, but it's quite clever and also gives you something fascinating to look at while listening.

The display feature, if it appeals to you, may give Keynote a slight edge over Micro Music. On the other hand, the sound provided by Keynote is a standard squarewave tone, while Micro Music's tone quality can be changed to "thinner" and "even thinner", as the manual puts it.

The three tone qualities are created by squarewaves with duty cycles of 50, 25 and 12.5 percent, respectively (or so they seem on my old 'scope). The lower duty cycles generate less of the fundamental and more the higher frequencies, making the sound seem "thinner."



```
                    FUER ELISE/DIXIE/BUMBLEBEE
BREAK IN 252
READY
```

Keynote

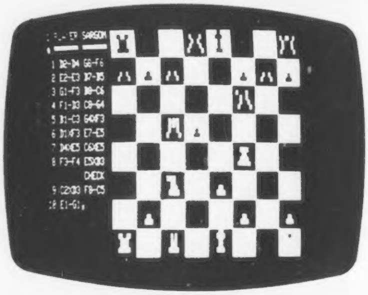
With Keynote, you can write a tune 1,500 notes long, which, when examined in review-and-edit mode, is filed in "pages" of 40 notes each. You can change, delete or insert notes, and then write the piece to a cassette tape, for later playback into the computer. Micro Music has a similar editing feature.

Although I like the way Keynote displays an approximation of the printed music, Micro Music is easier to use. To repeat a segment in the latter, you use parentheses and a number to indicate how many times you want it repeated, as in (4CDE), for example.

With Keynote, you write a segment, and then if you want it repeated you have to go into review-and-edit mode, select the starting and ending note numbers of the segment to be repeated, and the segment is then "automatically copied to the end of the current end of the song," which is a very clumsy way of handling repeats.

Sargon II

In David Levy's book, *More Chess and Computers* (reviewed in the Jan. 1981 issue), he describes Sargon as "currently the best of the microcomputer programs available."



```
        SARGON
 1 D2-D4 G8-F6
 2 E2-E3 D7-D5
 3 G1-F3 B8-C6
 4 F1-D3 C8-G4
 5 B1-C3 G4XF3
 6 D1XF3 E7-E5
 7 D4XE5 C6XE5
 8 F3-F4 E5XD3
         CHECK
 9 C2XD3 F8-C5
10 E1-G1
```

Sargon II

Sargon II, a 16K Level II game by Dan and Kathe Spracklen, and priced at $29.95, has all the features you'd probably want if you're into computer chess: seven

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CIRCLE 227 ON READER SERVICE CARD

What is a

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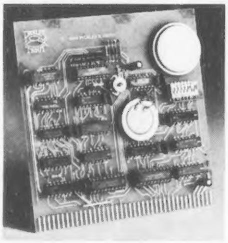
Another name for the **CCB-II**, which is:



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  hour, minute, second
- a calendar
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- an audio alarm

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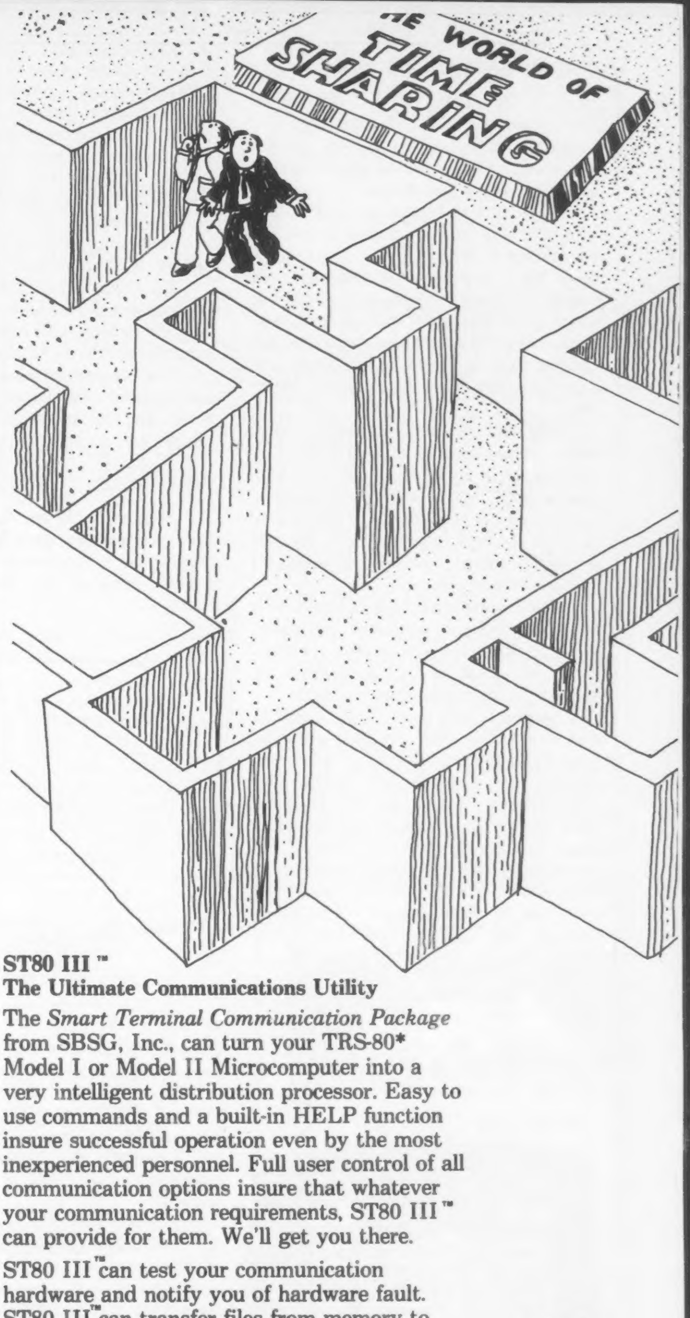
Warning: Installation requires opening the Model II, which may void its warranty. We suggest that you wait until the warranty period has expired before installing the CCB-II.

CIRCLE 242 ON READER SERVICE CARD

See us at the West Coast Computer Faire—booth #212.



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CIRCLE 260 ON READER SERVICE CARD

TRS-80 Strings, continued...

levels of play (from Level O with immediate response, to Level 7 with about four hours to make a move); en passant capturing; pushing passed pawns toward queening; and a hint mode.

That last one, hint mode, is for players who need help, and operates at all levels of play except 0. When it's your turn to play, press the : key and the computer will display the move it considers good, but which is not necessarily the best move to be made. If you like the move, press ENTER and the piece is moved, or backspace and enter your own move, if you have a better one.

The hint mode isn't available until after several moves have been made. You can use it to make the computer play against itself, but because the response is instant and not thought out as thoroughly as when the computer is making its own moves, the computer will usually (always?) beat hint-mode playing.

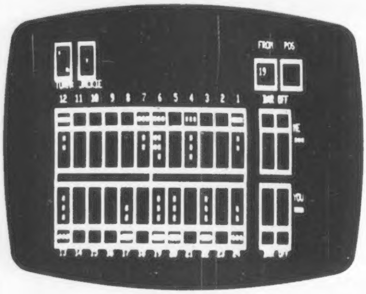
One fascinating feature of Sargon II is that it shows the computer "thinking" about making one move after another, displaying them all, while flashing an asterisk, until its final choice is made.

Sargon is also available in a $34.95 disk version. The older version (in case you want to compare) is $19.95 for a Level II cassette. Hayden also has a $15.95 book on Sargon by the Spracklens, containing the older version in assembly language, with a block diagram and sample printouts.

Setting up the chessboard to analyze a particular situation has been simplified from the previous method of stepping through each square on the board. Any square can now be reached directly.

Backgammon

Another 16K Level II game from Hayden, Backgammon is by Norman J. Wazaney, Jr., and is $10.95.



Backgammon

For some unexplained reason, Wazaney calls his version Brutus. It's about as complete as possible, with a manual that may be unique among computer-backgammon manuals (because it explains the rules), and a two-page program description for those who like to look at a LISTing, which is nicely full of REMs.

The dice roll can be controlled by the player or by the computer.

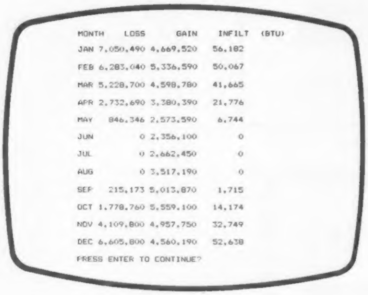
The most interesting feature of this version is that if you enter an H in the FROM box, the computer will display all your valid moves, which is most helpful if you're learning the game, or are at any time unsure of what you can do next.

Once you've really learned the game, you can use the author's hints on how to add new strategies, by inserting lines in the program according to his directions.

The computer won one game by waiting until I'd gotten all my pieces off the board, and then pretending I had a man on the bar and no valid moves. Sneaky.

Energy Miser

Written by James A. Gast of Super-Soft Associates, this $19.95 Hayden program is a "complete heating/cooling analysis program you may easily customize to fit your location. Calculates annual savings on utility bills for improvements or modifications including solar power, furnace type, better insulation, window furnishings, and more. Calculates return on investment and Energy Tax Credit," according to the cover of the accompany manual.



```
MONTH   LOSS      GAIN     INFILT  (BTU)
JAN 7,050,490 4,669,520   56,182
FEB 6,283,040 5,336,590   50,067
MAR 5,228,700 4,598,780   41,665
APR 2,732,690 3,380,390   21,776
MAY   846,346 2,573,590    6,744
JUN         0 2,356,100        0
JUL         0 2,662,450        0
AUG         0 3,517,190        0
SEP   215,173 5,013,870    1,715
OCT 1,778,760 5,559,100   14,174
NOV 4,109,800 4,957,750   32,749
DEC 6,605,800 4,560,190   52,638
PRESS ENTER TO CONTINUE?
```

Energy Miser

Before running the program, you have to "customize it to your geography," as the 20-page manual (with 15 pages of appendixes) puts it. You look up various figures in the appendixes, then change several program lines accordingly.

When you RUN the program, it asks you for all sorts of data on your house, starting with the size of windows facing the four directions, window types, window shading, weatherstripping or not, and then comes up with figures that show how much window heat is gained or lost for each month of the year.

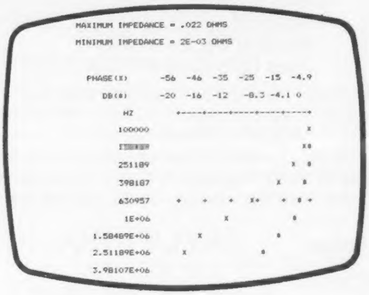
Then it does about the same thing for doors, roof, walls, floor, and provides totals of heat losses and gains for the whole house, for each month of the year.

Next it asks for system efficiency figures for the heating, BTUs from solar equipment, etc., and comes up with monthly and annual bills.

You can change any of the values to see how it affects the statistics, and you soon find out what savings can be made with changes to take care of poor insulation, leaky doors and windows, etc.

MCAP

For engineers and technicians, this $24.95 Hayden tape by Karl Savon, called MCAP: A Microcomputer Circuit Analysis Program, performs a linear voltage, impedance or transfer-impedance analysis of an electronic circuit.



```
MAXIMUM IMPEDANCE = .022 OHMS
MINIMUM IMPEDANCE = 2E-03 OHMS

    PHASE(X)     -56  -46  -35  -25  -15  -4.9
       DB(#)     -20  -16  -12   -8.3 -4.1 0
          HZ       +----+----+----+----+----+
      100000                                X
 [illegible]                               X#
      251189                            X   #
      398187                       X      #
      630957       +    +    +   X+    +  # +
       1E+06                 X          #
 1.58489E+06           X             #
 2.51189E+06        X            #
 3.98107E+06
```

MCAP

You enter the circuit description in nodal notation, for the resistors, capacitors, inductors, transistors, FETs, op-amps, etc., by putting them in DATA lines, and the program calculates, lists and plots the circuit's frequency response.

Circuits with up to 15 nodes can be analyzed. Because all circuit elements are entered in DATA statements, you can make additional runs with small circuit changes just by editing the appropriate line.

MADAF

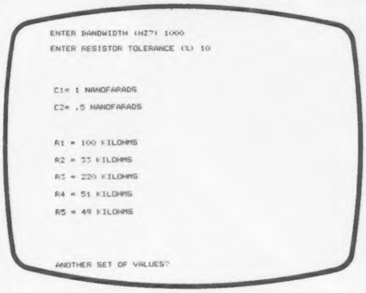
Although MADAF isn't the acronym of this $16.95 engineering program, it could be, since the name is Microcomputer-Aided Design of Active Filters.

The author is Jules H. Gilder, who last November switched from being editorial director of Hayden's software division, to editor of *Personal Computing,* which Hayden bought from Benwill Publishing Corp.

MADAF consists of eight programs: three will design active bandpass filters, two design notch filters, and the last three design active low-pass filters, including one for FET input.

The manual includes, for each program, a schematic and a typical printout.

A menu of eight programs is displayed. You choose one, enter variables such as frequency, gain, bandwidth and resistor tolerance, and the program computes the capacitor and resistor values, in the case of an active bandpass filter.



```
ENTER BANDWIDTH (HZ?) 1000
ENTER RESISTOR TOLERANCE (%) 10


C1= 1 NANOFARADS
C2= .5 NANOFARADS


R1 = 100 KILOHMS
R2 = 33 KILOHMS
R3 = 220 KILOHMS
R4 = 51 KILOHMS
R5 = 49 KILOHMS



ANOTHER SET OF VALUES?
```

MADAF

For a couple of the filter designs, the program supplies component values for nine standard values of capacitor C1, giving you nine different circuit designs for the same parameters.

Short Program #16

Here's a clever program from Robin Burke, which came on paper headed "Robin Burke Enterprises":

"I was very interested in the 'graphics-character graphics' section of your TRS-80 Strings column. Being a TRS-80 owner myself, I have found the graphics codes of great utility in my own programs. However, back before I emerged from the darkness of Level I into the daybreak of Level II, I found myself playing with the graphics mode of my machine and wrote several programs, one of which I have included here:

```
100 CLS: REM THE NEW FUTURE IN WALLPAPER BY R. BURKE
102 REM 9-21-78 13 YRS. HOLTVILLE, CA 92250
105 FOR X=1 TO 121: SET(X,0): NEXT X
110 FOR Y=1 TO 40
120 FOR X=1 TO 120 STEP RND(5)+1
130 SET(X,Y): NEXT X: SET(121,Y): NEXT Y
135 FOR X=1 TO 121: SET(X,41): NEXT X
140 PRINT @ 960, "PRESS ANY KEY TO SEE ANOTHER PATTERN. PRESS X TO END";
150 X$=INKEY$: IF X$="" GOTO 150
160 IF X$="X" THEN PRINT "BYE": END: ELSE 100
```

"It has been converted to Level II but can be easily converted back. Change lines 140, 150 and 160 to read like this:

```
140 X=5: PRINT at 960, "PRESS ENTER
    TO SEE ANOTHER PATTERN.
    PRESS 'X' AND ENTER
    TO STOP."
150 INPUT Q: IF Q=5 PRINT
    "BYE": END
160 GOTO 100
```

"What the program does is use a FOR/NEXT loop just as if it were filling the whole screen in solid, but the loop has a random step to create the design. Lines 105 and 135 simply add lines to the top and bottom to dress up the display somewhat.

"I have found these lines of code invaluable on a rainy day because of the endless possible modifications that can be made. As you may have observed, the symmetric effect is created by the fact that all the numbers the RND function can choose go evenly into 120 (the size of each 'line'). This may or may not introduce problems when increasing the value of the function. I personally do not mind a bit of asymmetricity here and there but some people might. To correct this, one might add line 115 and modify 120 thusly:

```
115 T=RND(7)+1: IF T=7 GOTO 115
120 . . . STEP T
```

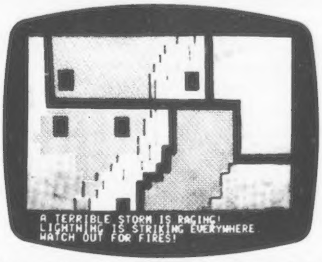
"I add a one to the random number to prevent a step of one, which does not appeal to me. Changing this value can also have interesting results. Another modification changes line 115 to read in this way:

```
115 T=RND(RND(20))+1: . . .
```

"This causes the value of T to tend toward the lower numbers, with an occasional larger value thrown in to make things interesting. The IF clause can then also be modified to account for the larger numbers by having it check for 11, 13, 14, 17, 19, as well as 7.

"I progressed a good deal in programming since I bought my computer a year ago but I don't consider this a bad effort since I was 13 at the time." □

Outdoor Games
Cassette CS-4010 $14.95 4 Programs Requires 16K Apple II or Apple II Plus

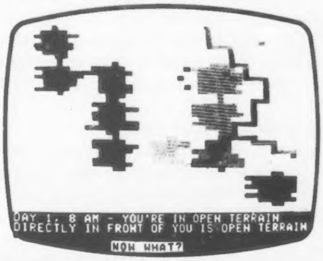


A TERRIBLE STORM IS RAGING!
LIGHTNING IS STRIKING EVERYWHERE
WATCH OUT FOR FIRES!

Forest Fire. Use chemical retardants and backfires to control raging forest fires.

GAS LEFT IS 89   WEATHER IS CLOUDY
WHAT IS YOUR MOVE(C,N,S,E,W, OR F)?

Fishing Trip. Try to catch flounder and salmon while avoiding logs, sharks, bad weather and running out of fuel.



DAY 1, 8 AM - YOU'RE IN OPEN TERRAIN
DIRECTLY IN FRONT OF YOU IS OPEN TERRAIN
NOW WHAT?

Treasure Island I. Your map shows buried treasure but unfortunately you don't know where you are. Try to find the treasure while moving about and observing your surroundings. You have a 3-day supply of food and water. You may find useful objects (compass, weapons, a horse) but watch out for hazards (robot guards, pirates, caves, crocodiles, mountain lions and more).

Treasure Island II. Same game except you have to use a metal detector to find the treasure.

Outdoor Games is available with Haunted House on disk for $24.95. To order use handy order form in the back of the magazine.

CIRCLE 300 ON READER SERVICE CARD

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CIRCLE 203 ON READER SERVICE CARD

Outpost: Atari

George Blank

Personal Greetings from the Outpost

This month's column may be heavy going for beginning programmers. I apologize for that, but my mail has contained many requests for a description of the special graphics features of the Atari computers and I need all of this month's space. Unfortunately, we need more subscribers interested in the Atari to justify a large Atari column. Most of you will want to save this material for future reference, even if you cannot use it yet.

Operating System Reference Manual

The long awaited complete information on the operating system is finally ready, and can be ordered by sending $30 to Atari Inc., Operating System Manual, Attn. Tom Harris, 1346 Bordeaux Avenue, Sunnyvale, CA 94082. The manual goes beyond the material I covered in the last three columns and contains over 200 pages of technical material. It is not elementary reading.

Adding Up and Down to our Back and Forth

Back in January's column we experimented with a program to move player missile graphics horizontally across the screen. That was the easy part. Much more difficult is vertical motion.

We could move small figures simply by PEEKing each byte and POKEing it into the next memory location, but that is a slow process and it is hard to do it between television refresh cycles for smooth motion. Instead we have chosen to fool the computer into thinking that the display area for Player 0 is a string variable, so that we can use Basic's machine language string movement routines to move our player around in memory.

In order to understand how to do this, it is necessary to know how Atari Basic stores variables in memory. Two areas are set aside in memory. The first, the Variable Value Table, stores 8 bytes of information on each variable declared in your Basic program. The second, the String Array Table, reserves space in memory according to the size specified when you dimension an array. For example, the very first command in our program, DIM P$(1), sets up information in the Variable Value table to tell us that string array variable number 0 has one byte of storage reserved and 0 bytes in use, and reserves one byte of memory in the array area to store the contents of P$.

The Variable Value Table

Memory locations 134 and 135 store the location in memory of the variable value table, which we can find by multiplying the contents of location 135 by 256 and adding the contents of location 134.

The first of the eight bytes reserved for each variable tells what kind of variable it is, whether scalar, array, or string. If it is a scalar variable, this byte is 0. If it is an array variable, bit 6 is set, and if it is a string variable, bit 7 is set. In addition, if an array variable is properly dimensioned bit 0 is set. We therefore should find this location to contain decimal values of 0 for scalar variables, 65 for properly dimensioned array variables, and 129 for properly dimensioned string variables. The second byte is the variable number, in order from 0 to 127. Since they are in order and in sequence, this is simply wasted memory. The other six bytes vary according to the type of variable.

Scalar Variables
Byte 1 is 0
Byte 2 is the variable number (0 to 127)
Bytes 3 to 8 contain a 6 byte Binary Coded Decimal number.
Byte 3 is the Exponent
Byte 4 contains the least significant two decimal digits
...
Byte 8 contains the most significant two decimal digits

Array Variables
Byte 1 is 65
Byte 2 is the variable number (0 to 127)
Bytes 3 and 4 contain the offset from the beginning of the Array Table Pointer area.
Bytes 5 and 6 contain the size of the first dimension of the array.
Bytes 7 and 8 contain the size of the second dimension of the array.
(Bytes 3 through 8 contain two byte numbers stored least significant byte first. To obtain the contents, multiply the second number by 256 and add the first number.)

String Variables
Byte 1 is 129.
Byte 2 is the variable number (0 to 127)
Bytes 3 and 4 contain the offset from the beginning of the String Array Table Pointer to the memory location holding the contents of the string variable.
Bytes 5 and 6 contain the dimensioned length of the variable.
Bytes 7 and 8 contain the number of the last location in the variable that has actually had information written to it.
As with the array variables, bytes 3 through 8 contain 2 byte numbers. Calculate the contents in the same manner.

Atari, continued...

Here is our January program modified to demonstrate vertical motion of player number 0:

```
Listing number ONE

100 DIM P$(1),B$(18),D$(18)
110 B$="(Put 18 hearts here using CONTROL COMMA)"
120 VTAB=PEEK(134)+256*PEEK(135)
130 ATAB=PEEK(140)+256*PEEK(141)

200 GRAPHICS 8
210 POKE 559,62 : REM REGULAR PLAYFIELD
230 POKE 704,88 : REM PLAYER 0 = PINK
240 PMBASE=PEEK(106)-8 : REM TOP OF MEMORY
250 POKE 54279,PMBASE
260 POKE 53277,3 : REM ENABLE DIRECT MEMORY ACCESS
270 POKE 53256, 3 : REM PLAYER 0 = 4 X NORMAL SIZE
280 PM0=PMBASE*256+1024+236

300 FOR Y=PM0 TO PM0+17
310 READ Z
320 POKE Y,Z
330 NEXT Y

340 POKE 53248,100 : REM INITIAL HORIZONTAL POSITION

400 DATA 60,60,60,60,60,60
410 DATA 255,255,255,255,255,255
420 DATA 60,60,60,60,60,60

500 OFFSET=256 * PMBASE + 1024 - ATAB
510 V3=INT(OFFSET/256)
520 V2=OFFSET-256*V3
530 POKE VTAB+2,V2 : REM NEW LOCATION OF P$ DATA
540 POKE VTAB+3,V3
550 POKE VTAB+4,20 : REM SET P$ LENGTH TO 276 BYTES
560 POKE VTAB+5,1 : REM (1 * 256 + 20 =276)
570 POKE VTAB+6,20 : REM BYTES IN USE = 276
580 POKE VTAB+6,1

590 D$(1,18)=P$(236,253) : REM PUT DRAWING IN D$

600 FOR X=236 TO 1 STEP -1
610 P$(X,X+17)=D$
620 P$(X+18,X+35)=B$
630 NEXT X

700 FOR X=20 TO 200
710 P$(X-18,X-1)=B$
720 POKE 53248,X
730 P$(X,X+17)=D$
740 NEXT X

800 POKE 53248,1 : REM MOVE HORIZONTAL POSITION OFF SCREEN
810 POKE 53277,0 : REM TURN OFF DIRECT MEMORY ACCESS
```

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CIRCLE 241 ON READER SERVICE CARD

Explanation of the New Portions of the Program.

I will not explain lines 200 through 420, as they have already been covered in January's column. The rest of the lines are explained in order.

Line 100 dimensions our string variables. We will trick the computer into putting P$ in the graphics memory area for Player 0, and we deliberately made it the first variable in the program so we could find it easily in the variable value table. If you add any other variable to this program before this line, the program will not work. We only reserve one byte of space in order not to waste memory in the string array table. We are going to change P$ to 576 bytes later. D$ will hold our data, and B$ will be used to blank out old pictures on the screen.

Line 110 sets up B$ as our blanking string. We need to fill it with zeros because any bit that is a one will light up a square on the screen. Since the Atari ASCII character for 0 is a heart, we fill the string with hearts using CONTROL COMMA. If you wanted to experiment with larger players, you would have to reserve more space for B$ and D$, and fill B$ accordingly.

Line 120 sets up the variable VTAB as a pointer to the Variable Value Table.

Line 130 sets up the variable ATAB as a pointer to the String Array Storage Area.

In line 280, player 0 is stored in memory in the 256 bytes beginning 1024 bytes after the address we have designated as the player/missile base address. We initially poke our character into the end of this area of memory.

Line 500 is where we play with the variable value table to fool the computer into relocating variable P$. This line calculates the distance in bytes from the beginning of the string array table (remember, P$ is the first variable declared, so it is at the beginning of the table) to the beginning of the memory storage area for player 0.

In line 510 we convert our offset into two bytes to store it in our variable values table. This line calculates the most significant byte of the offset.

Line 520 calculates the least significant byte of the offset.

Line 530 puts the least significant byte of our offset into the variable values table.

Line 540 puts the most significant byte of our offset into the variable values table. The table now locates P$ in the Player 0 graphics area.

Line 550 contains the least significant byte of our new length for P$. I chose 276 bytes to allow me to play easily with the blanking string at the end of the characters printed. Actually, the last 20 bytes are in the memory reserved for player 1, so if I was using 2 players I would have to be more careful.

Line 560 contains the most significant byte of the new length of P$. The computer takes the 1 here, multiplies it by 256, and adds the 20 from the line above to get 276 bytes.

Line 570 is just like line 550, except that it indicates that the whole length of P$ is active and usable.

Line 580 establishes the most significant byte of the usable length of P$, working just like line 560 above.

Line 590 fills D$ with the data we have POKED into memory near the high end of our Player 0 memory storage area.

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CIRCLE 232 ON READER SERVICE CARD

From now on, we will use D$ to move our Player 0 around.

In line 600 the FOR NEXT loop moves our player from the end of the Player 0 memory (bottom of the screen) to the beginning (top of the screen).

Line 610 puts our character at the appropriate location in memory.

Line 620 blanks out the 18 memory locations following our character. In the present application, it is overkill, since a single byte of string or a POKE could erase the one byte left. However, using a larger blanking string allows you to experiment with moving the player up to 18 steps at once.

Line 630 sends the computer back to print at the next location.

The routine in line 700 works the same as the routine at 600 to 630 except that horizontal motion is included. Player 0 will move from the top right of the screen to the bottom right. I have used the same variable for horizontal and vertical movement to simplify the program. There is no reason independent variables could not be used.

In line 710, since we are moving from top to bottom of the screen, we blank the memory before our character instead of the memory after the character.

In line 720, as we discussed in the January column, memory location 53248 is the horizontal position register for Player 0, and establishes the left edge of the character on the screen.

Line 730 puts our character in the new position.

Line 740 is the same as line 630.

Line 800 is not really a part of the demonstrtion. I don't have an easy way to clean up the garbage from this program, so I simply push the character off the visible portion of the screen. I could have used the blanking string to wipe out the character instead, but this is simpler.

Line 810 turns off direct memory access.

There you have it. High speed independent character motion from Basic. All you have to do is build on this and use the priority schedule and collision registers explained in last month's column, and you can do graphics with your Atari beyond the ability of any other small computer.

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CIRCLE 217 ON READER SERVICE CARD

Atari, continued...

The ANTIC Chip

In the February column we discussed the many functions of the CTIA dedicated microprocessor chip in the Atari computers. This month we will cover the ANTIC chip, another dedicated chip located in memory at D400 to D40E (54272 to 54287 decimal).

Write Addresses

54272 Direct Memory Access Control Register

```
 Listing number TWO

        0 = Turn of direct memory access display.
        Bits 1 and 0
             0     1   Narrow Playfield (Width = 128)
             1     0   Standard Playfield (Width = 160)
             1     1   Wide Playfield (Width = 192)
     Bit 2 = 1  Enable direct memory access for missiles.
     Bit 3 = 1  Enable direct memory access for players.
     Bit 4 = 1  Single line resolution for players.
     Bit 5 = 1   Direct memory access enable for  instruction
fetch.
```

54273 Character Control Register

```
 Listing number THREE

     Bit 0 = 1  Invert line of characters.
     (following for 40 character mode only)
     Bit  1 = 1   If Bit  7  of  character  code is  1, print
character black on white.
     Bit 2 = 1  If Bit 7 of  character code  is 1, blink that
character.
```

54274 - 54275 Pointer to display list

This is presented least significant bit first, then most significant bit. The display list is a sequence of one or three byte display instructions in memory. Each instruction can display one to sixteen lines of data on the screen. The single byte instructions consist of an opcode, while the three byte instructions consist of an opcode and an address. This address can be, depending on the opcode, the address in memory of data to be displayed directly, the address in memory of character data to be displayed indirectly, or a jump. If it is a jump, the address is loaded into the display list counter. Otherwise the address is loaded into the memory scan counter. In the case of single byte opcodes, memory is displayed beginning at the present location of the memory scan counter.

A full explanation of the memory map and character displays is too long for this column. I have asked a guest columnist to explain the display list in the June column.

54276 Horizontal Scroll Register
54277 Vertical Scroll Register

These registers are triggered by flag bits in the instructions from the display list. Bit 4 of the display list instruction is a horizontal flag bit and bit 5 is a vertical flag bit. A one in the flag bit activates the scroll register, rotating the display right or up from 0 to 15 locations according to the number in bits 0 to 3 of the scroll register.

54279 Player Missile Base Address Register
54281 Character Base Address Register

We used the first of these registers in line 250 of our demonstration program to establish a location for our display data. For an explanation of how this memory is organized, see my January column, page 179. The character register works with character data in graphic modes 0 - 2.

The Player Missile Base register and location 54278 can also be used in 2 line resolution modes as a player missile scan counter (bits 0 to 6), player missile select register (bit 7), and using bits 10 to 15 as the address register.

The character register can also be used in conjunction with 54280, using bits 0 to 2 to indicate the character line and bits 3 to 8 for the character name. Bits 9 to 15 then become the base register.

54282 Wait for Horizontal Blanking Synchronization

Writing to this address sets a memory latch that pulls the READY line on the microprocessor low, causing output to stop until the next horizontal blank on the screen automatically resets the latch.

54286 Non-maskable Interrupt Enable

A zero in this location disables the interrupts, except the RESET button, which is always enabled. Only bits 6 and 7 are used. If bit 6 is a 1, the vertical blank interrupt is enabled, and if bit 7 is a 1, the display list instruction interrupt is enabled.

Read Addresses

54287 Non-maskable Interrupt Status Register

This register identifies the causes of interrupts. Bit 5 indicates that the RESET button was pushed. Bit 6 indicates an interrupt caused by the beginning of a vertical blank. Bit 7 identifies a display list instruction interrupt. Write a zero to this location to reset this register.

54285 Vertical Light Pen Register
54284 Horizontal Light Pen Register

These addresses identify the contents of the light pen registers.

54283 Vertical Line Counter

This location points to the current vertical line. This register is somewhat tricky, as it does not simply give the line number, and can count singly or doubly. ☐

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Debra Howard

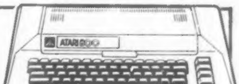
Find and circle each word appearing in the list, crossing the word off the list as you find it in the puzzle. Be careful not to obliterate any letters in the puzzle, as some letters are used in more than one word. Words may appear in any direction. ✳ The remaining letters spell the puzzle's solution: what it is all about.

Arm, Array, Assembler, Basic, Bounce, Card, Cassette, Challenger, Chip, Close, Computing, Creative, Cursor, Custom, Data, Debug, Disk, Else, Enter, Feedback, Firmware, Flowchart, Fortran, Games, Gosub, Graphics, Hobbyist, Impact, Input, Lightpen, Library, Memory, Nor, Pascal, Peek, Printer, Processor, Program, Remark, Resume, Run, Save, Software, Talk, Tone, Turns, User, Work, Yes.

Hint: Answer is 24 letters, 3 words.

The solution appears on page 225.

Debra Howard, 111 Cleaveland Rd., 20, Pleasant Hill, CA 94523.



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CIRCLE 263 ON READER SERVICE CARD

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WAR1 is played between Apple and a player or between two players. You may play with total knowledge of each others fleet or only ships sensor knowledge of the opponents fleet. Each player builds his starting fleet and adds to it during the game. This building process consists of creating the size and shape of each ship, positioning it, and then allocating the total amount of energy for each ship.

During a player's turn he may dynamcially allocate his ships total energy between his screen/detection and attack/move partitions. The percentage of the total energy allocated to each partition determines its characteristics. The screen/detection partition determines how much energy is in a ship's screens and the detection sector range of its short range sensors. The attack/move determines the amount of energy the ship can attack with, its attack sector range, and the number of sectors it can move in normal or hyperspace.

When an enemy ship is detected by short range sensors, it is displayed on the universe and a text enemy report appears. The report identifies the ship, its position, amount of energy in its screens, probable attack and total energy, a calculated detection/attack/move range, and size of the ship. Also shown is the number of days since you last knew these parameters about the ship. When a ship's long range sensor probes indicate the existence of an enemy presence at a sector in space, this sector is illuminated on the universe.

An enemy ship is attacked and destroyed with attack energy. If your attack energy breaks through his screens, then his attack energy is reduced by two units of energy for every unit you attack with. A text battle report is output after each attack. The program maintains your ship's data and the latest known data about each enemy ship. You may show either data in text reports or display the last known enemy positions on the universe. You can also get battle predictions between opposing ships. The text output calculates the amount of energy required to destroy each ship for different energy allocations.

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Apple~Cart

Chuck Carpenter

Correspondence is always welcome and a response will be made to those accompanied by a SASE. Send your letters to: Chuck Carpenter, 2228 Montclair Pl., Carrollton, TX 75006

Wow! Did anyone send in their $190,000 for the Radcom Plus+ FSK/CW board? (Dec '80 column.) I'm sure by now you know the price is $190.00. And, the program for it is not **called** Integer Basic — it's **written** in Integer Basic.

READER INPUT

This month I'm going to catch-up on all the reader contributions. I've been collecting them for a few months, and now have several. Which brings up a point. When I batch them like this, the ones received last get into the column right away. Those sent earlier don't get used for several months. So, from now on, anything sent to me will be used in the next column. It will still be 3 to 4 months before you see it. That's the cycle time from the time I write a column to the time it gets printed.

Reset Defense

Those of you having the Autostart ROM can use these suggestions from Douglas Dougherty (I didn't save his address). The first item is in response to a letter by Robin Ault in the June '80 issue. The letter claimed there was no software defense against accidentally pressing the RESET key. Douglas writes . . . "This is completely untrue! Since $3F2 contains the 'soft-entry vector', the RESET key can cause a jump to anywhere the programmer desires. To make a program reset proof, follow these steps!

1. Assemble the following program at location $300.

```
TSX                 ;GET STACK POINTER
LDA  102,X          ;FETCH HIGH BYTE
LDY  101,X          ;FETCH LOW BYTE
INY                 ;INCREMENT IT
TAY
JSP  $F940          ;PRINT Y   X
RTS
```

This routine will report its return address by reading it from the stack.

2. Get back into Basic and type CALL 768. You should see — 23 D8, showing that $D823 is the address to continue in Basic. (Note that the symbol $ indicates a hex number . . . CC)

3. If your system does not have a disk, that is, no DOS, follow these steps from the monitor.

```
* 3F2 : 23 D8         ;LOAD BASIC CONTINUE
* FB6FG               ;SET POWER UP BYTE
* 0G                  ;BACK TO BASIC
```

If you have DOS, the above will clobber it every time the RESET key is pressed. Therefore, DOS users should see that the original content of $3F2 is $9DBF, the address of a subroutine which re-enables DOS, and ends with a JMP ($9D5E). The address $9D5E contains $D43C, the normal continue-in-Basic address. So type *9D5E:23 D8 to set the new address. Now, if we type in the following Basic program, and run it, we shall see that it lives up to its claim.

```
10 PRINT "THIS PROGRAM IS RESET PROOF" :
   GOTO 10
```

However, if RESET is pressed repetitively, quickly enough, a ?SYNTAX ERROR will occur and halt the program. But, simply adding 5 ONERR GOTO 10, will solve this problem. The program becomes goof-proof against everything including using a CONTROL C. (If you want to trap the control C, use the associated error code in a code line. The error codes can be found on pages 114-115 of The DOS Manual . . . CC) Exceptions are turning the machine off and throwing a brick at your Apple. Incidentally, assuming you are running DOS, this all reduces to the following:

```
10 X=9*4096+13*256+5*16+14
20 POKE X,35 : POKE X+1,216
   : REM ENABLE RESET PROTECTION
30 POKE X,60 : POKE X+1,212
   : REM DISABLE IT
```

Douglas included two other items of interest in his letter. The first describes an interaction between the use of FRE(0) and the Applesoft Renumber/Append program. Second, he describes how to edit a program line without picking up extra spaces.

Use of the Applesoft FRE(0) function after using the Renumber/Append program — implemented with the & command — will produce disastrous results. Says Douglas, "I have not a clue as to why this is true, but if one says X=FRE(0) after any & (if & points at Renumber/Append, a very useful program, by the way), it will cause the screen to flash and the system to go bonkers, requiring you to turn it off and on again to recover. On one occasion this caused the clicking sound which signifies power supply failure, which in turn caused a disk file to get messed-up. I hope that Apple will notice this and fix it in the next version of Renumber/Append."

Continuing with multiple line statements, Douglas adds . . . "Any of you out there who, like me, try to pack as many statements as possible into a multiple statement line will have noticed what a pain it is to recopy them when editing a program. Due to the way Applesoft formats a listed line you will pick up extra spaces at the beginning and end of the lines . . . However, POKE 33,33 sets the line width down, and the extra format spaces will not be inserted. Hence the line can be copied exactly. The following program segment, which should be put into a text file, then EXECed into an existing program, when needed, will be of help in these situations:

```
1 HOME : POKE 33,33
2 LIST 00001
3 REM LIST IS AT 2067-2071
4 INPUT "#";L% : L$=STR$(L%)+100000
  : FOR I=2 TO 6 : POKE 2065+I,ASC(MID$(L$,I))
  : NEXT I : GOTO 2
```

Now type RUN then the program line to be listed and then CONTROL C (RETURN) to get out, and the program line will be ready to be copied. Use the escape codes to move the cursor as required."

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Apple Cart, continued...

My thanks to Douglas for sharing some of his discoveries and suggestions. This last example may be confusing to the beginner. The real reason for including it was to show the use of POKE 33,33. The normal window width stored at address 33 is 40. Applesoft, in formatting a listing, adds 7 spaces to lines that continue on another line. The lines look better with uncluttered line numbers. But, any text you type will include these spaces if you copy over them with the cursor. This will not occur with commands, equations or between multiple line statements; only text between quotes. You can simply type the POKE 33,33 as a direct command, too. To reset the window width after you have done your editing, type TEXT or POKE 33,40 (or even RESET). Remember to retype any control codes you have included in a line. Things like CONTROL D will not be copied when the cursor is passed over a line.

Wandering Apples

Do you have a need to provide some security for your Apple? This idea from Jim Levin at the University of California at San Diego will be helpful then. Jim suggests using an automotive ground strap, a bicycle cable, and a combination lock.

- First, loop the ground cable up through and back down through the ventilation slots in the bottom plate of the Apple. This will put the holes in the cable next to each other.
- Next, loop the bicycle cable around some secure object. A pipe or desk leg for instance.
- Finally, lock the ground cable and bicycle cable together with the padlock.

Jim acknowledges that this is not maximum security. But, it will keep the Apple from **walking away.** The parts are readily available and inexpensive. You may qualify for insurance this way too.

Jim has also included some Pascal information. The information is related to the Pascal programs included in the August '80 column. Procedures for Inverse, Normal and Flash were included. The following Language Card Assembler routines demonstrate how Jim worked around some pecularities in his version of the assembler. He further points out that each .proc line has to end with ,0 and there has to be a .END at the end.

```
bk1. VIDEO.TEXT

          .PROC INVERSE,0
          LDA    0C083
          LDA    0C083
          LDA    #0
          STA    0D8ED
          LDA    0C088
          RTS

          .PROC NORMAL,0
          LDA    0C083
          LDA    0C083
          LDA    #080
          STA    0D8ED
          LDA    0C088
          RTS

          .PROC FLASH,0
          LDA    0C083
          LDA    0C083
          LDA    #040
          STA    0D8ED
          LDA    0C088
          RTS
          .END
```

Readers are left to their own devices to find out if these procedures work. My abilities in Pascal are limited (more than in Basic). So these procedures, included for your information, are untested.

Direct Text

Here's a little program from H. Owen Jones from Gormley Ont., Canada that lets you put characters directly in the text area of memory. Owen did this to determine how memory locations correspond with screen position. Here's the Applesoft program.

```
10 HOME
20 I=1024 : J=32
30 IF PEEK (-16384)>127 THEN END
40 POKE I,J+128
50 I=I+1 : J=J+1 : REM  INCREMENT MEMORY, NEXT ASCII
60 IF I<>2047 THEN 90 : REM OUT OF TEXT MEMORY?
70 I=1024 : HOME : GOTO 30 : REM YES, START OVER
90 IF J=95 THEN J=32 : REM RESTART ASCII SEQUENCE
100 GOTO 30
```

The program fills the screen with the available character set. Pressing any key will stop the program. Variables are initialized to the beginning of text memory (I) and the lowest ASCII value (J, decimal). Note that when the ASCII value is POKEd, the number 128 is added to it. This ensures that the display mode is NORMAL. If 128 is not added, the INVERSE mode is obtained.

Owen suggests a couple of enhancements, too. Adding this line:

```
35 POKE I-1,32+128
```

will display a single character. The character moves across the screen and changes as it does. The rest of the screen is filled with ASCII spaces. Add 40 to the initial value of I and add this line:

```
45 VTAB 1 : PRINT"ADDRESS : ";I
```

to see a display of the current memory location. You can slow the speed of the display down by using the SPEED command or inserting a delay loop. This routine demonstrates the possibilities of inserting text directly on the screen. It is not necessary to use the tab commands.

Some additional comments. I would change line 30 to read:

```
30 IF PEEK(-16384)> 127 THEN POKE -16368 : END
```

Having read the keyboard data (-16384), the keyboard strobe (-16368) should be reset. Do this to avoid problems reading

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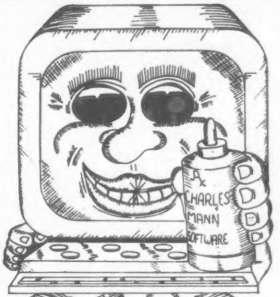

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Apple Cart, continued...

the keyboard at some other point in a program. Note that these are addresses $C000 and $C010 respectively. For more information on the memory locations used for the screen display of text, see pages 16 and 82/83 of the Reference Manual. The last pages are actually the memory locations that are **not** used by text memory.

Rounded Applesoft

Geoff Puterbaugh from Sunnyvale, California contributed the program in Listing 1. He found that Apple insists on changing numbers from one form to another. For instance, Geoff typed in:

```
PRINT .001
```

and found that . . . "the gleeful response from the Apple is —

```
1E-03"
```

After several frustrating and futile attempts at rounding he found that any number less than 0.01 will be printed in exponential notation (a computerized form of engineering notation). This previously unnoticed "feature" of Applesoft was found on page 4 of the Applesoft Reference Manual. Since business programs don't require exponential notation, the program in Listing 1 was written to convert numbers to conventional decimal notation.

The subroutine is given a variable called "FLOTE" (your program should determine that this is less than 0.01 before calling the subroutine) and returns two variables; OUT$ and EFLAG. If EFLAG is zero there is a problem. The actual subroutine begins on line 100 and ends on line 290. The other lines simply call the subroutine with various values of FLOTE. A sample run of the program included with Geoff's letter showed how Applesoft would print a number and the results of using this program. Incidentally, the PRINT USING command in other versions of Basic keeps you from having to do this. (Microsoft Basic-80 that comes with the Z-80 Softcard for instance.)

GET vs INPUT

A program by Alan Thomas using the GET command in place of the INPUT command was included in the Oct. '80 column. Eric Shenk from Harrisonburg, Va. has found another way to do something similar. Eric, as have others, finds the lack of an LINPUT command one of Applesoft's problems. The LINPUT command, allows typing most anything into an INPUT statement. With Eric's program, the LINPUT command is effectively implemented in Applesoft. The program uses the keyboard input buffer ($200) and monitor routines to convert input into a string. See Listing 2.

```
LIST

10  GOTO 1000
100 OUT$ =  STR$ (FLOTE)
105 EFLAG = 0
110  FOR MARK = 1 TO  LEN (OUT$)
130  IF  MID$ (OUT$,MARK,1) = "E"
      THEN EFLAG = 1:EMARK = MARK
     :MARK =  LEN (OUT$)
140  NEXT MARK
150  IF EFLAG = 0 THEN 290
160 EXP =  VAL ( MID$ (OUT$,EMARK
      + 2,2)): REM   GET VALUE OF
      EXPONENT
170 MANTISSA$ =  MID$ (OUT$,1,EMA
     RK - 1): REM   PROBABLY HAS
     A DOT IN IT
180  IF EMARK = 2 THEN 200: REM
     THERE IS NO DECIMAL POINT IN
      THE MANTISSA
190 MANTISSA$ =  LEFT$ (MANTISSA$
     ,1) +  MID$ (MANTISSA$,3,EMA
     RK - 1): REM  REMOVING THE D
     ECIMAL POINT FROM THE MANTIS
     SA
200 NICE$ = "."
210  FOR MARK = 1 TO EXP - 1
220 NICE$ = NICE$ + "0"
230  NEXT MARK: REM   NICE$ IS NO
     W ".00" THRU ".000000000---
     (EXP)"
250 NICE$ = NICE$ + MANTISSA$
290 OUT$ = NICE$: RETURN
1000  PRINT " *** VARIOUS IRREGUL
     AR SMALL NUMBERS *** "
1010  FOR FLOTE = 1 / 64000 TO .0
     1 STEP .00238
1020  GOSUB 2000
1030  NEXT FLOTE
1040  PRINT " *** REGULAR PATTERN
      OF SMALL NUMBERS *** "
1050  FOR FLOTE = .0004 TO .004 STEP
     .0002
1060  GOSUB 2000
1070  NEXT FLOTE
1080  END
2000  PRINT " APPLESOFT'S ORIGINA
     L IDEA FOR THIS NUMBER : ";F
     LOTE
2010  GOSUB 100: IF EFLAG = 0 THEN
      PRINT " ABORT!! ** APPLESOF
     T NOT BEHAVING": PRINT " AS
     ADVERTISED!!": END
2020  PRINT " REFORMATTED NUMBER
     IS                        : ";O
     UT$
2030  RETURN
```

Listing 1. Program by Geoff Peterbaugh to format numbers in decimal notation.

```
 LIST

10   GØSUB 10000
20   PRINT A$
25   IF A$ = "STØP" THEN  STØP
30   GØTØ 10
9998  REM
9999  REM
10000  CALL ( - 657)
10010 A$ = ""
10020  FØR J = 1 TØ 256
10030  IF  PEEK (J + 511) = 141 THEN 10060
10040 A$ = A$ +  CHR$ ( PEEK (J + 511))
10050  NEXT J
10060  RETURN

]RUN
YØU NØTICE THAT, IT ACCEPTS CØMMAS!
YØU NØTICE THAT, IT ACCEPTS CØMMAS!
IT WILL ALSØ ACCEPT ":", AND QUØTES AND JUST ABØUT ANYTHING ELSE!
IT WILL ALSØ ACCEPT ":", AND QUØTES AND JUST ABØUT ANYTHING ELSE!
STØP
STØP
```

Listing 2. Program by Eric Shenk to Simulate the LINPUT Command in Applesoft Basic.

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Apple Cart, continued...

According to Eric . . . "The actual subroutine is lines 10000 to 10060, 7 very short lines. In the sample run, the first line is the input, while the computer prints the second line in verification. Of course, this won't allow quite as much flexibility as Mr. Thomas' program, in that, if you want to not accept certain characters, you can't throw them out immediately. (Although it would be no problem to throw out "illegal" characters by checking PEEK(J+511) between lines 10030 and 10040.) This routine has the following advantages:

1. It will accept any character — leading/trailing spaces, commas, colons, quotes, and control characters — except the carriage return.

2. Since it's using the monitor routines, all editing features (available on the Apple . . . CC) are automatically available without extra programming.

3. It will accept a full line of input and it's very short and totally not messy!

In short, it's exactly the same as an LINPUT statement (probably) would be in Applesoft."

And, I agree. The LINPUT command used in Microsoft Basic (Z-80 card) does just that. If you use this command, you can type whatever format you choose into the input line. Prevents you from having to use special formatting on dates and so on.

Another commend on Alan's program comes from Paula Hodgkinson (again, didn't save the address). She has been using the program quite a bit. A problem occurred though, when she used it in a program that saved the string to a disk. Paula says . . . "The problem is in line 10011. The RETURN at the end is added to the string. It becomes an invisible character that doesn't show up on the screen. When I saved the string to the disk the invisible RETURN at the end of the field (or record) became the next field (or record) read. This messed up everything after that.

I caught this by checking the length of my string and found out it was one longer than it should be. Once I realized what the problem was, fixing it was simple. Just change line 10011 to:

```
IF A$ = A5$ THEN A$ = A1$ : PRINT : RETURN
```

You don't need to add the RETURN to the end of the string."

Integer Cataloger

Here's a program from Norman Clarke from Hoffman Estates, Ill. This program combines the Puffer program from the Aug. '80 issue, and the Integer Basic Cataloger program from the Sept. '80 issue. The Integer program did not have the neat scrolling capability that the Applesoft version did. Norman's program uses the Puffer program to add the scrolling feature. See Listing 3.

```
  1 DIM A$(70),B$(6),C$(70)
  5 POKE -16298,0: POKE -16300,
    0: TEXT
  7 P=0:Q=0:I=0
 10 D$="": PRINT D$;"NOMONCOI":
     CALL -936: PRINT D$;"CATALOG"

 20 I=I+2: IF SCRN(4,I-1)=10 THEN
    20:P=I/2
 30 VTAB P+Q: TAB 4
 31 PRINT "[  ]":Q=Q+1:R=I+Q*2-2
    : COLOR=(Q+128)/16: PLOT 4,
    R-1: COLOR=(Q+128) MOD 16: PLOT
    4,R-2
 40 IF SCRN(4,R+1)#10 THEN 30:T=
     PEEK (37): GOSUB 200
 45 GOSUB 200
 50 K= PEEK (-16384): IF K>176 AND
    K<181 THEN 60: IF K=181 OR
    K>192 AND K<193+Q THEN 80: GOTO
    50
 60 IF K=177 THEN B$="LOAD": IF
    K=178 THEN B$="LOCK": IF K=
    179 THEN B$="UNLOCK": IF K=
    180 THEN B$="DELETE"
 61 VTAB 1: TAB 1: CALL -868
 70 PRINT " PRESS 'LETTER' YOU WISH
    TO ";: IF K=180 THEN POKE 50
    ,127: PRINT B$;: CALL -198
 80 POKE 50,255: POKE -16368,0:
     IF K>176 AND K<181 THEN 50
    : IF K=181 THEN END :I=I+(K-
    193)*2-2: IF SCRN(1,I)=2 AND
    B$="RUN" THEN B$="BRUN"
 85 PRINT
 90 FOR X=7 TO 39: POKE 2046+X,
     SCRN(X,I)+ SCRN(X,I+1)*16:
     NEXT X
 92 PRINT D$;B$;A$
100 GOTO 5
200 A$="TYPE LETTER TO RUN, OR LOAD=
    1 LOCK=2 UNLOCK=3 DELETE=4 EXIT=
    5->"
210 B$="RUN"
220 VTAB 1: PRINT A$(24)
230 FOR U=1 TO 100: NEXT U
240 C$=A$(2,63)
250 C$(63)=A$(1,1)
260 A$=C$
270 K= PEEK (-16384): IF K<128 THEN
    220
280 RETURN
```

Listing 3. Integer Cataloger Revisited.

Again, my thanks to all who have sent ideas, programs, comments and suggestions. I'll use them whenever practicable and of course, more timely from now on.

INPUT TESTING

Someplace I read that Applesoft would not allow you to test the ASCII value of characters in an INPUT statement. Since I have been doing this in some of my programs, I don't have the foggiest notion what this person meant. The ASCII value of any character depends on the "on" bits (0-5) used to represent the particular character. As you probably know, ASCII is an acronym for the American Standard Code for Information Interchange. A unique value from 0 to 127 is assigned to each of 128 numbers, letters, special characters and control characters. Your Apple does not allow all the characters to be used. There is no direct lower-case capability for instance. Additionally, the Apple adds bits (6 & 7) to the code to provide inverse and flashing capability.

There are commands in Applesoft to let the programmer deal directly with the ASCII value of a character. If you want to 'generate' a specific character, you would use the CHR$(N) command. N represents the decimal equivalent of the ASCII value. To test the value of a character in a string, you would use the ASC (A$) command. The following routine is a modification of one I have used to test for input from a menu. See Listing 4.

```
]LIST
100  HOME : PRINT "INPUT A NUMBER
      0 - 6"
110  PRINT : PRINT "WHICH NUMBER
     DO YOU WANT...";: GET A$: IF
      ASC (A$) < 48 OR  ASC (A$) >
     57 THEN  PRINT : PRINT "ENTR
     Y IS NOT A NUMBER": FOR I =
     1 TO 3000: NEXT I: GOTO 100
120 S =  VAL (A$)
130  IF S = 0 THEN  PRINT : PRINT
     "END": END
140  PRINT : PRINT : IF S < 1 OR
     S > 6 THEN  PRINT "INCORRECT
      SELECTION": FOR I = 1 TO 30
     00: NEXT I: HOME : GOTO 100
150  PRINT : PRINT : PRINT "THAT'
     S RIGHT": PRINT "YOU MADE IT
      PAST THE TRAPS."
]
```

Listing 4. Demo Program Illustrating the Use of the ASC Command to Test Input.

Lines 100 and 110 ask you to input a number from 0 to 6. The number is accepted into the program as a string. This is necessary in order to use the ASC command. Next, the value of the input is tested for correct ASCII range. If the range is not correct, a message is displayed for a few seconds and program control is returned to the input line. A correct range indicates that the input was a number. You could restrict the range to just the numbers you wanted. I didn't do that, choosing instead to check for correct numbers in another line. Line 120 converts the string to a real number. The integer command modifier could be used here if you wanted to be sure the number was an integer. I have never experienced any difficulty by not specifically using integers. In line 130 the program is ended if the number selected is zero. I usually use this to escape from my menu.

Correct number range is tested in line 140. Again, if the range is wrong, program control is returned to the input line. At this point my program usually uses an ON (X) GOTO statement. I like this approach for selecting the program segment to be used as a result of a menu selection. In this example, I tested for the input to be in the range of ASCII numbers and then for the correct number range. If these both occurred then a message was printed to say so. As you can see, whoever said Applesoft would not allow you to test for the ASCII value of a number was wrong. Pages 138 and 139 of the Applesoft Basic Programming Manual include the Applesoft ASCII character codes.

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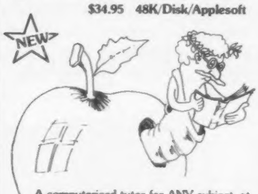

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Apple Cart, continued...

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And lots more.

If you are considering the purchase of a product, let me know. I'll give you my opinion and let you know where you can find more information. There are several sources of review information now. Check the advertisements in the magazine. You can find most of them listed there one time or another.

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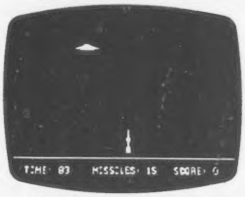
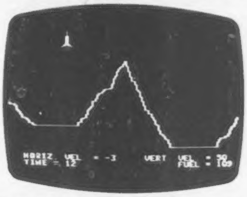


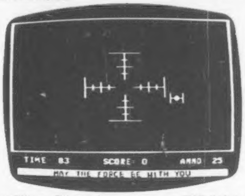
```
TIME: 83   MISSILES: 15   SCORE: 0
```

Saucer Invasion. Fire missles to destroy the invaders who fly at different speeds and altitudes.



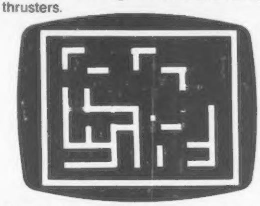
```
HORIZ  VEL  = -3     VERT  VEL  = 30
TIME  = 12                 FUEL = 169
```

Rocket Pilot. Maneuver your spaceship over the mountain using horizontal and vertical thrusters.



```
TIME  83        SCORE: 0        AMMO  25
         MAY THE FORCE BE WITH YOU
```

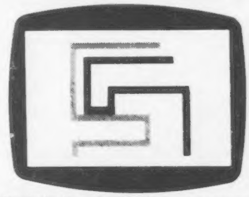
Star Wars. Shoot down as many TIE fighters as possible in 90 seconds.



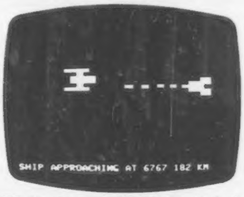
Dynamic Bouncer. A colorful, ever-changing graphics demonstration.

Strategy Games

Cassette CS-4003 $11.95 4 Programs Requires 16K Apple II or Apple II Plus

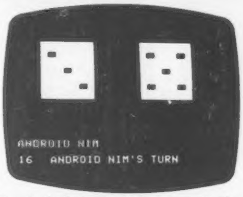


Blockade. Build a wall to trap your opponent, but don't hit anything.



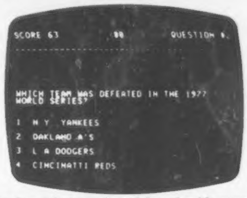
```
SHIP APPROACHING AT 6767 182 KM
```

UFO. Use lasers, warheads or guns to destroy an enemy spacecraft.



```
ANDROID NIM
16   ANDROID NIM'S TURN
```

Skunk. A 2-player strategy game played with dice, skill and luck.



```
SCORE 63            00          QUESTION 6.
-----------------------------------------

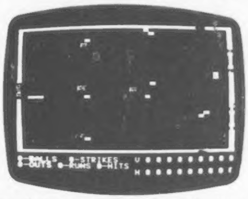
WHICH TEAM WAS DEFEATED IN THE 1977
WORLD SERIES?

1  N Y  YANKEES
2  OAKLAND A'S
3  L A DODGERS
4  CINCINATTI REDS
```

Genius. A fast-moving trivia quiz with scores of questions.

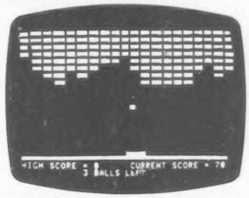
Sports Games-I

Cassette CS-4002 $11.95 4 programs Requires 16K Apple II or Apple II Plus



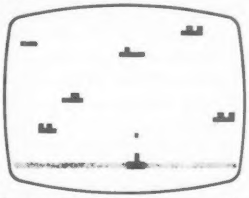
```
0-BALLS  0-STRIKES
0-OUTS 0-RUNS 0-HITS
```

Baseball; A 2-player game with pitching, batting, fielding, stealing and double plays.

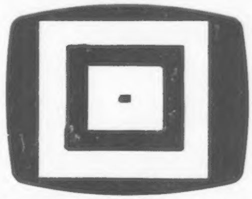


```
HIGH SCORE = 0        CURRENT SCORE = 70
              3 BALLS LEFT
```

Breakout. Four skill levels and improved scoring make this the best breakout ever.



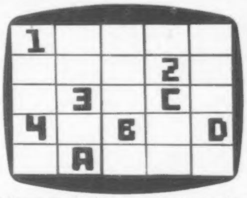
Torpedo Alley. Sink as many warships as possible in 2 minutes.



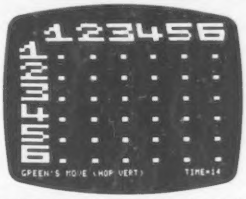
Darts. Use game paddles to control the throw of 6 darts.

Brain Games

Cassette CS-4004 $11.95 7 programs Requires 16K Apple II or Apple II Plus

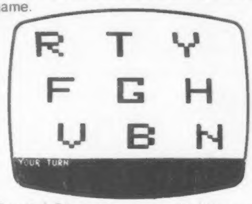


Dodgem. Be the first to move all your pieces across the board in this intriguing strategy game.



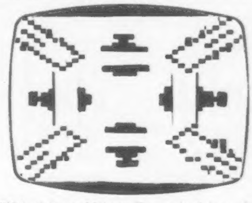
```
GREEN'S MOVE (HOP VERT)        TIME=14
```

Nuclear Reaction. A game of skill, fast decisions and quick reversals of position.



```
YOUR TURN
```

Parrot. A Simon-type game with letters and tones. **Dueling digits** is a version with numbers.



Midpoints and Lines. Two colorful graphics demonstrations. **Tones** lets you make music and sound effects.

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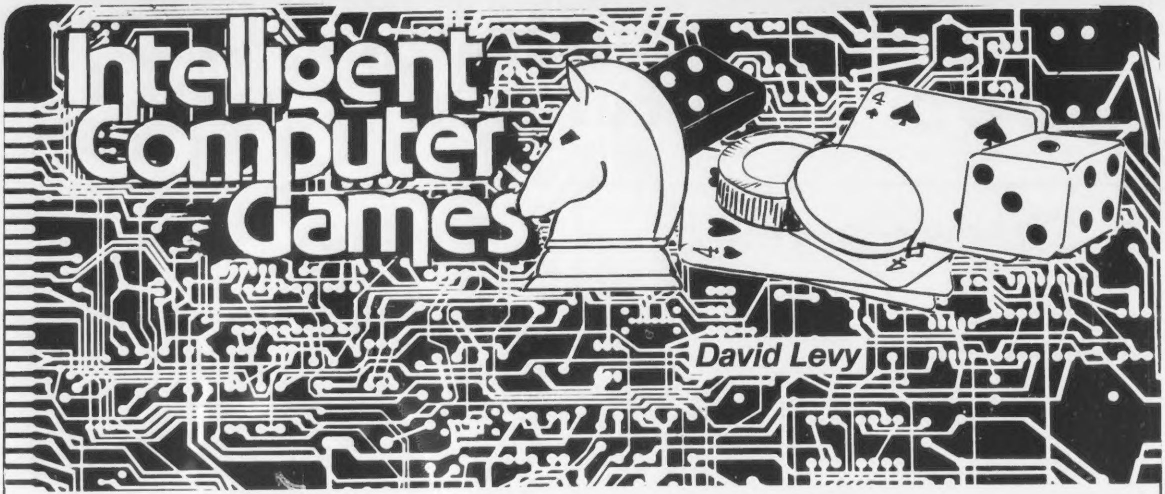


Intelligent Computer Games

David Levy

Correspondence is welcome. Letters with interesting questions and ideas will be used in the column along with a response. No personal replies can be made. Send to: David Levy, 104 Hamilton Terrace, London NW8 9UP, England

Poker

For some reason which I fail to understand, poker is one of the most widely misrepresented games ever invented. Most people who do not know how to play poker consider it a game of luck, in which the person who gets dealt the best cards wins. I have even heard highly intelligent people refer to poker as a 'base, gambling game.' And there are those who associate poker with the card sharps of the 19th century Mississippi steamboats and assume that every poker player is some sort of low life. These opinions could not be further from the truth and, in my opinion, there is no less skill in poker than in chess or bridge.

The game of poker that became famous during the days of the Wild West is now known as five-card draw and is still popular. But there is another family of poker games which require even greater skill and which are much more interesting to play: these go under the generic name of stud poker. This month, I shall describe in some detail how a stud poker program might be written and next month I shall write about the older form of the game — draw poker.

Five-Card Stud

Briefly, each player is dealt one card face down and one card face up, and may look at his own down card. A round of betting takes place, and all those who put in the necessary amount of money on this round will stay in the game and receive a second face up card (the others drop out of the hand). After receiving the second up card, the players indulge in another round of betting and, once again, those who put in the necessary remain for a further round, while the others drop out. The third up card is followed by another round of betting, and then comes the fourth and final card up and the fourth and final round of betting. When the last round of betting is over, those remaining in the hand turn over their one down card, and the player with the best five cards wins the money. In order to determine whose cards are the best, the following ranking applies to the hands:

Straight flush: This is the best type of hand to have, and most regular poker players will only have such a hand a few times in their life. A straight flush is five cards of the same suit which are in an unbroken sequence, for example the 6, 7, 8, 9, and 10 of hearts.

Four of a kind: As its name suggests, this type of hand has four cards of the same denomination.

Full house: Three cards of one denomination and two of another, for example three 6's and two aces.

Flush: All five cards of the same suit but not in an unbroken sequence.

Straight: All five cards in an unbroken sequence, though not all of the same suit.

Three of a kind: Three of the cards are of one denomination, the other two are not of the same denomination as each other.

Two pairs: For example two aces and two 7's — the fifth card is of no importance unless two players have the same two pairs, in which case the fifth card breaks the tie.

One pair: Aces is the highest pair, then kings, queens, and so on down to 2's.

High card: If a player has none of the above hands, then his holding is valued in accordance with the highest denomination card in his hand (ace is high) and then if two players have the same high card their second highest cards are compared and so on.

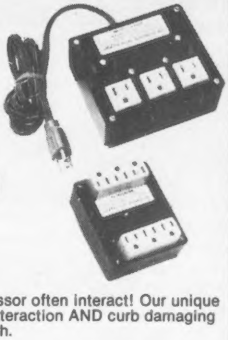
So much for the procedure and the ranking of the hands. Various betting options exist in most forms of poker, the most common ones being:

Bet: At the start of a round of betting, one player is first to speak. There are various methods for deciding who is first to speak and in stud poker it is usually the player with the highest face up cards. He has two options, he may bet or he may 'check.' If he wishes to add to the money in the pot, the player bets, by putting into the pot any amount of money that is in accordance with the house rules. We shall assume that we are playing 'pot limit,' which means that the size of the bet may be anything from one unit up to the total amount of money already in the pot. So if the pot stands at $10 and we are playing in $1 units the first person to speak may, if he wishes to bet, put in any amount from $1 to $10.

Check: If the person whose turn it is to speak does not wish to bet and no-one else has put money in on that round of betting, he may say 'check,' which means that he does not wish to put money in at this stage but he may decide to do so when it is next his turn. If, at any time in a round of betting, all the players check in succession, then the round of betting is over.

Call: Once someone has put some money into the pot during a round of betting, the next player must put in at least the same amount if he wishes to remain in the game. Putting in the same amount as the others is known as calling. When all the players have put money into a particular betting round, that round may only end when all of the players bar one have called — at that point everyone has put in the same amount.

Raise: It is possible to put in more than the previous bettor and this is known as raising. If the first player puts in $1 and the second player wants to put in an extra $1, he will say something like 'your $1 raise $1,' and put $2 into the pot. Once there has been a raise it is necessary for all the players after the last raiser to call the bet before the round is at an end, so that everyone will



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have contributed the same amount to the pot. The maximum that can be raised is the amount in the pot before the raise takes place. So if the pot stands at $1, and the player bets $1, making the pot $2, the second player can put in the $1 to meet the bet and then raise $3 (the current size of the pot).

Pass: Sometimes known as 'fold.' This is what happens when a player decides that he no longer wishes to take part in this particular hand — he turns his cards face down and relinquishes all claim to the money. Beginners often think that passing is cowardly but in fact more hands are passed by good players than by bad ones.

Some Basic Principles

Two essential principles should be followed in a game of stud poker. On card two and card three (i.e. when you have a total of two or three cards, including the down card), you should *never* put money into the pot unless your cards so far, including the down card, can beat every hand that you can see on the table. The reason for this is obvious enough — if your up cards are a 6 and an 8 of different suits, and your down card is a 2, and if your opponent is showing a 5 and a 9 of different suits, you should not be putting money into the pot because you are beaten 'on the table' and your opponent has a hidden card which may well go nicely with the others. Many beginners make the mistake of assuming, in a situation such as this one, that they have just as much chance of 'hitting a pair' (i.e. getting another 2, 6 or 8 on the fourth of fifth card) as their opponent and so it is almost an even money shot if they stay in the pot. But this is false accounting. Firstly, your opponent may already have a pair — his down card might be another 5 or a 9. In this case he will certainly beat you if you do not draw a pair; he may beat you even if you do draw a pair because his pair of 9's or 5's may be higher than your eventual pair; and if he does not yet have a pair and you both draw a pair, he has better chances than you because his cards at the moment are higher than yours, so it will be odds on that his pair will be higher than yours. The only way that you can win is if he does not make a pair and you do, but then your pair may be 'open' (i.e. both cards face up) in which case he will not put any money into the pot on card five. If you don't believe me, try it for yourself.

The second golden rule is that when betting on card four, don't put money into the pot unless you have 'equity,' that is to say, unless the ratio of the money already in the pot to the money you are now putting in is no less than the odds against you having a winning hand when the last card is dealt.

A simple example will explain this principle. Suppose that you hold the 2, 3, 4 and 8 of hearts (the 2 is the down card) and that your opponent is showing the 5 of clubs, the 5 of diamonds and the 10 of spades. The pot stands at $10 and your opponent bets $10. What should you do? In order to win the hand, and to be sure that you are winning the hand, you need to hit a fifth heart to make a flush. Then, unless your opponent already has three of a kind or two pairs, and makes a full house on the last card, you must hold the winning hand. And if he does have a chance of making a full house you will see it from his fifth card, so there will be no danger of your betting too heavily on the fifth round.

Since you need to hit a heart to win and you have already seen four hearts (the ones in your hand), there are nine hearts. The odds against your hitting a heart are therefore (44-9):9, or 35:9 (almost 4 to 1). But your equity, or investment odds, are only 2:1, because there is $20 currently in the pot and you must put in $10 to stay in. In making this calculation it is important to remember that the money in the pot does not belong to you in any way, even though you put some of it in there — the money belongs to the pot until someone wins it. It is also important to remember that you cannot usually count on winning any more money on the fifth round of betting, because your opponent will not be obliged to put in any more money, but there will be some occasions when it *is* reasonable to assume that your opponent will put money in the pot after the fifth card.

It is precisely because of this concept of equity that it is vital to make a good-sized bet when you are in the lead, because otherwise you are making it cheap or free for your opponent to stay in the pot, and then he may hit better cards than you do later on in which case he will 'steal' the pot. In the above situation, for example, if your opponent bets only $1 instead of $10, he is playing like a sucker. You call his $1 bet and now you have 11:1 money odds while the odds against hitting a winning card are only about 4:1. If your opponent plays like that often enough, in the hope of 'sucking you in' to the pot when you really should be out of it, he will be sorry to see his financial empire crumbling as you get better cards than he one hand out of five.

These two golden rules provide the basis for solid play in a game of five-card stud. Of course like most rules of thumb, there will be occasions when they should be broken, but it takes a good player to recognize these situations and, until you or your program is a regular winner, you should play it safe. There is one exception, and that is concerned with bluffing, about which I have written a little in the past. To play good poker it is essential to bluff occasionally, but the good player will judge when to bluff by taking careful note of his opponents' styles of play and their mannerisms. I shall write more on the subject of bluffing next month, when we will be looking at draw poker, so for our stud poker program let us assume, for the time being, that there will be no bluffing. I shall give an algorithm for programming stud poker but its parameters are subject to variation at the reader's discretion. In order to illustrate the algorithm, I shall describe one hand of stud poker in some detail and for the sake of simplicity I shall assume that the program is playing against only one opponent — you may extend the principles of the algorithm to a higher number of players and I would recommend five or six as being the right number for a personal computer program.

The Algorithm in Action

Our stud poker algorithm is based on a system for estimating the probability that our opponent's down card is of a certain denomination. These probabilities are adjusted in the light of information obtained from his play, or more precisely, from the way that he bets during the hand. Other factors, such as bluffing and poor play by the opponent, could also be included in such an algorithm but for the purpose of this example I shall keep things as simple as possible. The reader ought to have little difficulty in generalizing from this example, to produce a routine that implements the algorithm successfully.

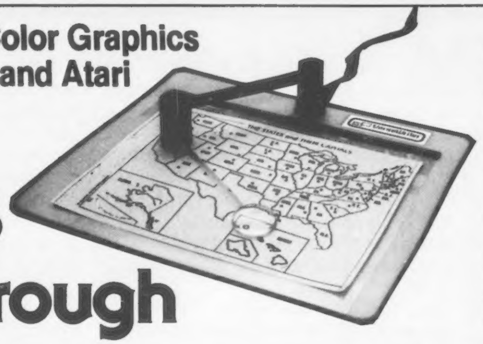
Let us suppose that when the cards are dealt the program receives the Ace of clubs as the down card, and the 9 of hearts as the up card. The opponent has the 8 of diamonds as his up card.

PROGRAM:(A C) 9 H
OPPONENT:(??) 8 D

Before the betting begins, we can already make certain probability estimates about our opponent's down card. We have seen one ace, one 8 and one 9, and there are 49 unseen cards at this stage in the proceedings. Of these 49 cards three are aces, three are 8's and three are 9's and there are four of every other denomination. So without any more information to go on, we can estimate the probabilities of the opponent's down card being an ace as 3/49, of its being a king as 4/49, a queen 4/49, and so on, giving us Table 1.

The program has the highest face up holding (9 is higher than 8), so it opens the betting. There is an 'ante' of $1 in the pot, so the program bets $1 and the opponent decides to call, putting in $1 to make the total amount of money in the pot $3. From the fact that our opponent called, it is reasonable to make two deductions: (a) he almost certainly has a down card which can beat a 9, otherwise he was very foolish to call the bet; (b) he may have another 8,

High-Resolution Color Graphics for the Apple and Atari



Graphics Breakthrough

How many programs have you written that would benefit from animated high-resolution graphics? Probably several. It is this kind of dramatic graphics that distinguish outstanding programs from ordinary ones. But if you've ever agonized for hours or days just to get one image perfected, you're probably not anxious to do it again. Now there's a better way.

New Graphics Entry System

Today there is a new graphics system available that is not only amazingly user-oriented but surprisingly economical. Called VersaWriter, it starts with an ingeniously simple entry board consisting of a 14" X 12" high impact plastic bed with a tough clear plastic overlay sheet. The original drawing or diagram is fastened with masking tape to the plastic bed and then covered with the clear sheet. Instead of using a light pen or complicated electronic X-Y head, the VersaWriter uses a double jointed arm attached to the top of the entry board at one end and a magnifying lens with crosshairs at the other end. The VersaWriter resembles a draftsman's pantograph on a smaller scale.

At each joint in the arm of the VersaWriter is a potentiometer. A cable from these pontentiometers connects to the paddle input of the computer. No special interface electronics or board is needed. Since the arm of the VersaWriter bends only in one direction, each point on the plotting head corresponds to a unique set of resistances on the potentiometers. All that's needed now is software to translate these resistances into usable screen coordinates.

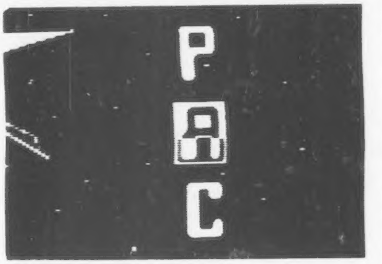
Exceptionally powerful software

It is in the software where VersaWriter really stands out. VersaWriter comes with two full disks of user-oriented software. First it has sets of "low level" commands for entering, creating and copying drawings and diagrams. Secondly, it has extensive sets of application routines for moving, enlarging, rotating, coloring or animating drawings that the user has created.

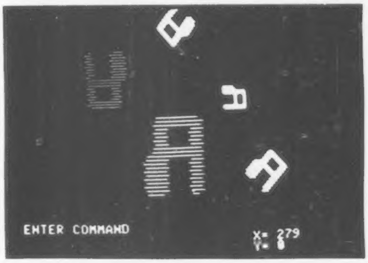
Graphics Systems

Versa Writer	**$249.00**
Kurta Graphics Tablet	**695.00**
Summagraphics Digitizer	**745.00**
Houston Instruments Hi Pad	**795.00**
Apple Graphics Tablet	**795.00**

Of course the basic commands let you enter a drawing freehand or by tracing it. Want a wider "brush stroke"? Six widths are available. Drawings can be independently scaled in both the vertical and horizontal directions. An enclosed shape may be filled in with any of 212 colors. No, that is not a misprint—by the same technique that a printing press can create hundreds of colors from three primary ones, so can VeraWriter.



Here a shape (the letter A) is being scanned. After putting it in a shape table it may be used in other programs.



```
ENTER COMMAND
                    X= 279
                    Y= 8
```

From the shape table, a shape (the letter A) may be enlarged, shrunk, rotated, colored or moved about the screen.

Create Animation for Other Programs

The shapes you create with VersaWriter can be used and manipulated with ease in other programs. Up to 255 shapes can be entered into a shape table. These shapes may then be placed on the screen in any position or may be overlaid on a full or partial screen image. Animation is produced easily by moving about a portion of the image created by VersaWriter. For example, by alternating between two images of an airplane propeller it will appear to be spinning.

Other VersaWriter software includes textwriter with which text can be added to graphics. Upper and lower case, choice of color, text size, direction and starting point all may be specified.

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CIRCLE 239 ON READER SERVICE CARD

DENOMINATION	PROBABILITY
Ace	0.061
King	0.082
Queen	0.082
Jack	0.082
10	0.082
9	0.061
8	0.061
7	0.082
6	0.082
5	0.082
4	0.082
3	0.082
2	0.082

Table 1. Probabilities for opponent's down card before first round of betting (correct to three decimal places).

giving him a pair of 8's but if he did have a pair of 8's he might well have raised the bet, so he is probably less likely to have another 8 than to have a 10, J, Q, K or A. (This deduction can be made into a learning mechanism, so that after playing a long session against the same opponent, the program could estimate the number of hands in which the opponent had not raised with a pair on card two.)

We must now apply some formula to adjust the old probabilities in the light of the new information received. This must be done in some way that weighs the importance of the old information relative to the new. Since the information that we had prior to the first round of betting was all *a priori* information, whereas we now have some *a postori* information, I would give the new information something like four times as much weight as the older information. Furthermore, I would suggest that we assume it to be twice as likely that the opponent's hole card was an A, K, Q, J or 10 than another 8. So from the assumptions made on the basis of the one called bet we can estimate the probabilities of the various denominations being the opponent's down card as in Table 2.

Ace	King	Queen	Jack	10	9	8	7	6	5	4	3	2
2/11	2/11	2/11	2/11	2/11	0	1/11	0	0	0	0	0	0

(2/11 = 0.182; 1/11 = 0.091)

Table 2.

These fractions come from the fact that we wish to estimate the probability that he holds an ace, king, queen, jack or 10 as being twice as great as the probability of his holding an 8, and we must have all the probabilities adding up to 1. We estimate the probabilities of his holding a 9, 8, 7, 5, 4, 3 or 2 as being zero, on the assumption that he is not playing badly, though as I mentioned before, this presumption can be varied by the program itself.

We must now combine the old and new probabilities in accordance with their weightings (new:old = 4:1), and so the new measure for the opponent holding an Ace as his down card is given by:
(0.061 x 1) + (0.182 x 4) = 0.789
The measure for the King is given by:
(0.082 x 1) + (0.182 x 4) = 0.810
The Queen, Jack and 10 have the same old estimates and the same new estimates as the King, so their revised measures are all given by:
(0.082 x 1) + (0.182 x 4) = 0.810
The measure for the 9 is given by:
(0.061 x 1) + (0 x 4) = 0.061
The measure for the 8 is given by:
(0.061 x 1) + (0.091 x 4) = 0.425
and the measures for the 7, 6, 5, 4, 3 and 2 are all given by:
(0.082 x 1) + (0 x 4) = 0.082

Finally, to arrive at the new probability estimates for all the denominations, we need to normalize these figures so that the total probability adds up to 1. So we sum the above measures:
0.789 + (4 x 0.810) + 0.061 +
0.425 + (6 x 0.082) = 5.007
and divide each of them by 5.007 to arrive at the new probability estimates (Table 3).

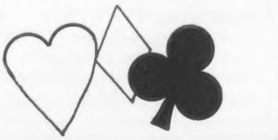
DENOMINATION	PROBABILITY
Ace	0.789/5.007 = 0.158
King	0.810/5.007 = 0.162
Queen	0.162
Jack	0.162
10	0.162
9	0.061/5.007 = 0.012
8	0.425/5.007 = 0.085
7	0.082/5.007 = 0.016
6	0.016
5	0.016
4	0.016
3	0.016
2	0.016

Table 3. Probabilities for opponent's down card after the first round of betting.

The first round of betting is now over, and the dealer gives each of the players one more card. The program receives the 7 of spades while its opponent gets the 10 of clubs, so the situation on the table now looks like this:
PROGRAM: (A C) 9 H, 7 S
OPPONENT: (??) 8 D, 10 C
and there is $3 in the pot. The opponent is now 'high,' i.e. he has the highest cards showing on the table, since 10, 8 is better than 9, 7, and so it is the opponent to open the betting on this round. He may check, or he may bet anything from $1 to $3. Let us assume that he bets the maximum of $3.

The first thing that the program must do is to determine whether or not, on the basis of the probability estimates that it had before this $3 bet, the opponent is likely to have the winning hand and if so, by what margin of probability. In order to be winning at this stage, the opponent must hold, as his down card, an Ace, an 8 or a 10. An ace would give him A, 10, 8 against A, 9, 7, while a 10 or an 8 as the down card would give him a pair. From Table 3 the program can determine that the probability of its opponent's down card being an A, 8 or 10 is:
0.158 + 0.085 + 0.162 = 0.405
So the probability that he does not hold the winning hand is 1 − 0.405 = 0.595, and the odds against the program having the winning hand are 0.405:0.595, or 1:1.47. If the program calls the $3 bet, since the pot now stands at $6 the program will be getting 2:1 money odds, so the program definitely has enough equity to call the bet because 2:1 is better than 0.68:1. From this calculation the program may determine that is is safe to call the bet. The algorithm ought to have some randomly-based adjustment in its calculations to determine when to raise rather than call — possibly this might be a probability function whose input parameters are the actual odds against the opponent having the better hand, and some measure of how the opponent sees the situation. It is clearly better for the program, when raising the pot, to have its strength hidden in the down card if it wants the opponent to stay in the hand, while it is better to have all its strength on the table (with the 'threat' of more strength in the down card) if it is trying to bluff its opponent out of the pot.

Having made the above calculations, the program has determined that it is safe to call the $3 bet but since the odds against the opponent having the best hand at this stage are only 1.47:1, it would be a little imprudent to raise at this stage. What the odds should be is not an easy question to answer but I would recommend not raising unless the odds are at least 2:1. (In fact I would recommend an over-riding heuristic, under which the program would never raise when the opponent could have a cast iron cinch, as here, if he has another 10, the opponent knows for sure that he is winning.)



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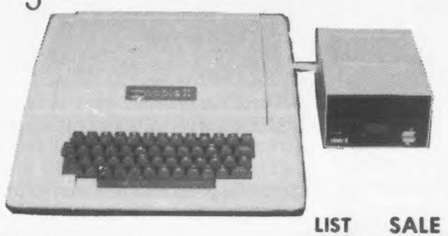

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CIRCLE 256 ON READER SERVICE CARD

Intelligent Games, continued...

The program therefore calls the $3, making the total in the pot $9 and the dealer gives out another card to each player; this time the program gets the 6 of diamonds and its opponent the Jack of spades, so the situation on the table is now this:

PROGRAM: (A C) 9 H, 7 S, 6 D
OPPONENT: (??) 8 D, 10 C, J S

and there is $9 in the pot. The opponent is still high, since J, 10, 8 is a better holding than 9, 7, 6, but the program's hidden Ace is still an important card, because unless the opponent already has a pair or an Ace, the program is still winning. The situation has now been made even more complicated because the latest cards to be dealt give each player, in theory at least, the chance for a straight if the fifth card is exactly right. For example, if the opponent's hole card is a 9, 7 or Q, he can make a straight on card five by hitting a 7 or Q (if he holds a 9), or a 9 (if he already holds a 7 or Q).

The opponent's betting situation has improved somewhat since his highest face up card is better than the program's highest face up card, the opponent's second highest up card is better than the program's, and so is his third highest up card. So the opponent happily tosses in $9 with a smile on his face that the poor microcomputer cannot see. What should the program do now? Answer: stay calm and calculate the odds. In order to be winning at this stage, the program's opponent must hold an Ace, 8, 10 or J as his hole card. The probability of this, from Table 3, is:

0.158 + 0.085 + 0.162
+ 0.162 = 0.567

This means that the program probably doesn't hold the winning hand at the moment, but the odds against it holding the winning hand are only 0.567:0.433, or 1.31:1, whereas if it calls the $9 bet it is getting 2:1 money odds, since the $9 bet has made the pot up to a total of $18. Therefore, the program should still call this bet, even though the odds indicate that at this stage it is probably not holding the best cards. So the program calls the bet, the pot stands at $27, and the fifth and final card is dealt. The program gets an Ace while its opponent gets another Jack, so the players have the following cards showing:

PROGRAM: (A C) 9 H, 7 S, 6 D, A D
OPPONENT: (??) 8 D, 10 C, JS, JH

and there is $27 in the pot. The human opponent now feels very smug, with a pair of Jacks showing, and says, 'I suppose I ought to bet something — here is $20.'

The principles apply here, just as they did on the previous rounds of betting, except for the fact that this is the final round, after which whoever has the best cards will take the money. The program calculates that to beat it the opponent must have a Jack (for three Jacks) or a 10 or 8 in the hole (for two pairs). The probability estimates indicate that the total probability of the opponent having the winning hand is:

0.162 + 0.162 + 0.085 = 0.409

therefore the odds against the program are 0.409: (1−0.409) = 0.692:1, well below the money odds, so there is every reason to call the final bet.

Refinements to the Algorithm

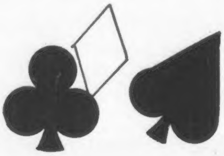
There are various ways in which the reader might care to modify this algorithm. To begin with, there is the fact that when, for example, the opponent hit a 10 at card three, the program knew that its original, *a priori* estimate of the probabilities wasn't accurate because the 10 of clubs was actually still in the deck. At that point it could have recalculated the original *a priori* probabilities in the light of the news that the 10 of clubs and 7 of spades were still in the deck after card two and this would have the effect of making the calculations of the probability estimates more accurate from card three onwards.

Another useful idea is to modify the probabilities all the way through the hand on the basis of the opponent's betting. If the opponent shows strength (i.e. raises when he could call, or bets when he could check) the program could assume that it was more likely that he held a good card, and adjust the probabilities for the good cards upwards by (say) 10 percent, normalizing the others as necessary. If the opponent showed weakness by checking when he might have been expected to bet, then the probabilities for the good cards could be adjusted downwards by 10 percent.

Bluffing plays an extremely important part in poker, so it would be as well to assume that on a certain percentage of occasions the opponent will bluff, and then adjust this percentage over a number of hands in the playing session. The program can then allow for the possibility of the opponent bluffing when making its calculations, possibly by calling a suitable proportion of slightly adverse equity situations.

More Players

If you want to get the most fun out of a poker program, I would suggest that you write one for six players, five hands being played by the program and one by the user. You can use similar probability estimates, although the actual calculations will be more complex and you will find the game with more players is more stimulating than the two-handed game. □



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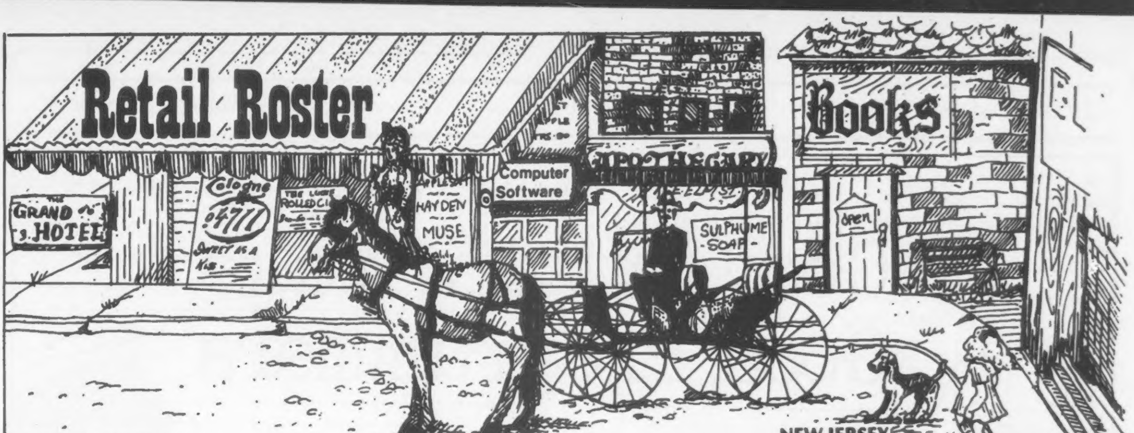

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Wayne Dickson

Good Writers Make Good Programmers

Considering the technical orientation of its readership, one of the most attractive and courageous features of *Creative Computing* is its willingness to print articles encouraging good writing. Similarly, one of its most amusing features is its occasional letter from a reader who is puzzled about that willingness.

Dear Sir:

I think your magazine is terrific. But why does a magazine about computers have all those articles about grammar and usage and prose style?

Sincerely,
Baffled

The editors' response is always firm but patient. In a practical sense, they say, an improved writing style will enable you to share your ideas more effectively with others. ("Potential contributors to *Creative Computing* please take note!" adds Ted Nelson.) Furthermore, in a more fundamental sense, good writing deserves to be encouraged for its own sake—if for no other reason, than for the simple joy and satisfaction it brings to a sensitive reader.

As an English teacher, I can appreciate that response. However, as a recently converted computer enthusiast and a fledgling programmer, I can add still another justification to those given by the editors. The fact is that the skills of prose composition and of "top-down" computer programming (at least in Basic) are so closely interrelated that careful attention to one will almost always bring improved competence in the other.

To begin with, the prose writer and the Basic programmer employ the same language—English. (Admittedly Basic is a primitive pidgin dialect, but it is still English.) Furthermore, the computer is just as particular about the spelling and punctuation of this language as the most fanatical Miss Fidditch who ever bullied a grammar class. The spelling "PRIMTT" will not be accepted; the comma cannot be substituted for the semicolon; the quotation marks at the beginning of a statement must be complemented by quotation marks at the end of that statement. This particularity is one reason why at our school we encourage remedial students in English to learn Basic.

Moving on to the "larger units of discourse" in Basic programming—subroutines, routines, and complete programs—the prose writer should feel equally at home. The process of creation and the principles of construction are very much the same in writing computer programs as in writing essays.

The first step in both is the most crucial and frequently the most difficult. In writing, this step is to define the thesis to be proved or question to be explored; in programming, it is to define the problem or task to be resolved. In both, the next step is obvious, to determine how best to accomplish the previously defined goal. In writing, this is done by marshalling and juggling the necessary arguments and evidence; in programming, by developing an appropriate algorithm (a systematic set of procedures for solving a problem or accomplishing a task).

Interestingly enough, the currently favored "top-down" method for developing a computer program is very much like the familiar technique for developing an analytical essay. The top level of the program corresponds roughly to the over-all framework of the essay, including perhaps its introduction and conclusion. The second level corresponds to the major sections in the essay: points in the argument, steps in the process, sets in the classification, etc. In both kinds of writing the process of subdivision continues until the complete argument or algorithm is exhausted.

To see how similar these techniques can be in practice, one needs only to compare the structure of this article with that of a typical quiz/tutorial program of the kind used in computer assisted instruction. To help in doing so, diagrams of these structures are included below.

After the skeleton is completed, the next step for the writer and for the programmer is to flesh it out with language. The former executes his rough draft, the latter his preliminary coding and documentation. For both there follows the drudgery, but also the discovery, of smoothing and polishing the finished product. At this point the writer should edit and proofread his essay, looking for such gremlins as missing transitions and misplaced modifiers. The programmer must debug his program, hunting such common slips as a "RETURN" without a "GOSUB" or a command to "GOTO" a line that does not exist.

Wayne Dickson, P.O. Box 1304, Stetson University, DeLand, FL 32720

Figure 1. Structure of Article.

Introduction: Encouragement of good writing by *Creative Computing;* statement of thesis.

- *Similarity of Language:* Both writers and programmers use dialects of the same language, English.
- *Similarity of Process:* Writers and programmers use comparable principles and procedures in completing their work.
- *Illustrative Diagrams*
  - *Structure of Article*
  - *Structure of Sample Program*

Conclusion:

Figure 2. Structure of Program. A typical quiz/tutorial program for use with almost any subject in a school classroom.

Introduction: Student is asked if instructions are necessary. If so, control of the program is sent to the "Instructions" routine; if not, it is sent directly to the "Quiz" routine.

- *Instructions Routine:* Instructions are displayed; then control is sent to the "Quiz" routine.
- *Quiz Routine*
  - *Question and Answer Subroutine:* Student is asked a predetermined number of questions and his answers are tested for accuracy.
  - *Score Tallying Subroutine:* After each response control of the program shifts here to update the student's total score; then it shifts back for the next question.

Conclusion: Score is obtained from the "Score Tallying" subroutine and reported. Student is given a congratulatory or admonitory message, as indicated.

It should be noted that in this final step considerations of style, elegance, and appearance are almost as important as outright errors. In both processes the procedures as recorded should "work," of course. But the reason for recording them is so that others might understand that working at another time or place. It follows consequently that the writer or programmer should make his work as clear and as attractive as possible. Frustrated or irritated readers are not often attentive to subtleties of meaning.

In addition to the usual concerns of style, the essay writer will help his reader with parallel structure, strong transitions, and concrete illustrations of abstract ideas. The program writer will make judicious use of blank lines, indentations, and "REMARK" statements to indicate structure. (Depending on his version of Basic, he may have to use "PRINT" statements, colons, and other dodges to achieve these effects.) In both cases concern for the reader and attention to form will pay substantial dividends.

The salient qualities of a good essay and a good program alike are efficiency and elegance. And because the two activities are so similar, the person who strives to achieve these qualities in one is in a much better position to achieve them in the other. Computer programmers should study effective writing if for no other reason than because such study will make them more effective programmers as well. □

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Oh, oh, looks like the computer's overloaded again.

Computerized Credit Cards

The French and Italians have developed credit cards with built-in computers for electronic banking purposes. Rather than slipping these new cards—which are about the size of ordinary credit cards—into a large computer, they will contain microprocessors of their own. Their electronic circuitry will take the place of the magnetic strips that hold credit information on regular cards.

These new cards are considered a part of a pre-paid system. Each card will be programmed to account for a certain amount of money, and after each purchase the card will be inserted in a special machine in the store that will record the transaction in its own memory and deduct the payment from balance on the computer card. "The big advantage of the system," says one French banker, "will be that the amount of credit to be put into the card memory will be negotiated in advance."

French computer credit cards are being developed by CII-Honeywell Bull, Philips Data Systems France, and Schlumberger Flonic. The Italian cards are being developed by SGS-ATES, As for the United States, there is no plan to market these cards as of yet, mainly because the magnetic card system is so well established here. However certain US banks have their eyes on the French and Italian developments and are considering a structure adaptable to international participation.—*The Wall Street Journal*

The Grays Matter

Recently a challenger of the world backgammon champion defeated this formidable adversary through a series of seemingly unconventional if not maniacal moves that were actually based on an amazing foresight and an iron-clad grip on the situation. However the champ retained his crown after this unprecedented and whirlwind defeat because the winner was a machine. Yes, for the first time a computer defeated a human *world champion* at an intellectual endeavor.

Hans J. Berliner of Carnegie-Mellon University, the man who constructed the program for the winning computer, places the real significance of this game on the ability of his machine to "capture the essence of judgement and deal with relatively ill-defined, fuzzy situations." Berliner went about giving his computer the ability to make such judgements by providing it with what he calls "real world knowledge."

Berliner calls his program SNAC: a Smooth Non-linear function with Application Coefficients In simplified terms, the SNAC program breaks away from clear-cut equations such as A=2B to consider the various conditions that A or B may came under, thus rendering the equation faulty in its simplicity. The equation "$\text{Value}=C_1A_1F_1+C_2A_2F_2+\ \ldots C_r A_I F_I$," has been given to illustrate the SNAC concept where F represents the number of items of a certain type, C represents their unit cost, and A represents the importance of the coefficient given certain information about the present situation.

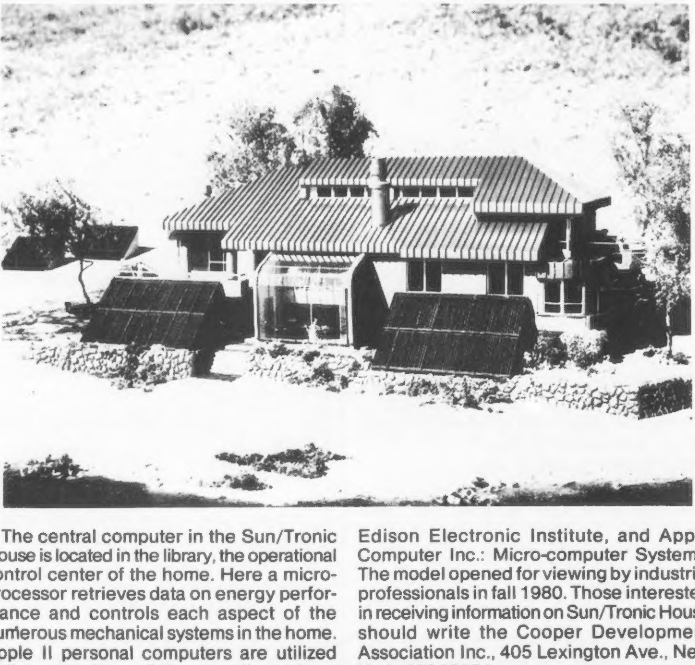
Berliner has recently revised his SNAC program, retired it from the player's seat and given it a coaching position where it is used to analyze a player's moves and determine whether they are good. In the long run, Berliner hopes to open the eyes of the general public to computers that can go much farther beyond the black and white, into the various and more realistic shades of gray.—*Science News*

House of the '80's

The Sun/Tronic House, a showcase house for the 1980's, has recently been completed near Stamford, CT. This three bedroom house, devised and built by the Cooper Development Association Inc., features active and passive solar heating systems plus computers that can serve as nursemaid, secretary, guard, entertainer and tax auditor.

The central computer in the Sun/Tronic House is located in the library, the operational control center of the home. Here a microprocessor retrieves data on energy performance and controls each aspect of the numerous mechanical systems in the home. Apple II personal computers are utilized both as monitors of the security systems and as a source of educational fun and games in the family room. There are also remote computer terminals in the kitchen and the master bedroom from which homeowners can check up on the kids, figure their taxes, or look up the guest list and menu from a previous dinner party.

Companies involved in the development of the Sun/Tronic House include General Electric Company, Solarex Corporation, Edison Electronic Institute, and Apple Computer Inc.: Micro-computer Systems. The model opened for viewing by industrial professionals in fall 1980. Those interested in receiving information on Sun/Tronic House should write the Cooper Development Association Inc., 405 Lexington Ave., New York, NY 10174.



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Gregory Yob

There's a Problem with Success

Now and then I get a letter saying "Your column is wonderful, etc., I subscribe to *Creative* just to read it, etc." Toward the bottom comes the punch line: "But your column didn't appear in the last issue! Will there be more of them???" Be assured, there will be more columns, probably with more spaces between them. I find myself with more and more neat things to do, and less and less time. Rather than doing this column on a monthly basis, my target is two issues out of three.

While we are at it, may I mention the subject of stamped self-addressed envelopes? Providing one considerably improves your chances of getting a reply.

A Neat Widget

If you own an "old-fashioned" PET with 8K, 6550 RAM chips so on, there's always the possibility that some of your RAM chips will fail. Finding 6550's is no mean feat, and Optimized Data Systems (P.O. Box 595, Placentia, CA 92670) sells an adaptor which will let you use the much more common 2114 RAM to replace your bad 6550's. For $24.95 you get a 3" x 5" card with two 6550 sockets, one 2114, and two 2114 sockets. Space is provided for eight 2114's which is 4K of your RAM. Two of these boards will permit total replacement of your 6550 RAM. The 6550 sockets let you use any good 6550 chips until they need replacement. (My own experience with an 8K PET is that once the "infant fatalities" are past that the RAM is very reliable. Two years of constant use did not kill any 6550 RAMs. However, your luck may be different.)

The Uncrasher

As those of you who work with machine language or exotic POKEs know, the PET can crash if you make an error. If you have the "old" ROMs, there is no hope—you must reset the machine, either by flipping the power switch or grounding the RESET line on the memory expansion. Your Basic or machine language program will vanish in the process. (If you have a memory expansion addressed to give a "hole" in your memory, the area above the hole will survive a reset. However, Basic can't use such forbidden areas.)

If you have the "new" ROMs, this awful fate may be avoided. Two pushbuttons, one wired to RESET and ground, and the other wired to the User Port's Diagnostic Sense and ground will let you preserve your program. To perform a PET resurrection press the Diagnostic Sense pushbutton, and while down, press and release the RESET pushbutton. When the display (which will be from the Monitor) appears, release the Diagnostic Sense button. Now, press semicolon (;), RETURN, and then move the cursor to the SP (which will be 1) and change it to F8. Press RETURN, X, and RETURN. You are now in Basic with your program intact. If you only press RESET, the PET will come back with the "BYTES FREE" message and your program vanishes. Failure to twiddle the Monitor will also leave you in the boonies.

ITS (P.O. Box 264, Woodbridge, VA 22194) sells two pushbuttons and the needed jumpering for $14.95(A *very* reasonable price) as the Uncrasher. Once you have the PET opened, it takes about two minutes to install—and is very definitely worth the trouble and cost. The pushbuttons mount handily on the back of the TV monitor out of the way of accidental handling. (I am sure you know about the Reset button on the Apple.)

The VIC

At the Consumer Electronics Show in Las Vegas, Commodore introduced (for the USA) the VIC (for the Video Interface Chip which is in the critter) which is a "poor man's PET" and costs about $300. I predict that this machine will become very popular, and here's why:

1) It can do more than the TRS-80 Color Computer, and costs $100 less.

2) It runs full PET Basic with some additions.

3) 172 x 172 dot graphics are possible, as well as eight foreground and sixteen background colors.

4) Lots of I/O on the back, including plug-in modules for RAM, ROM, IEEE 488 and so on.

5) The VIC can read standard PET tapes. Happy program conversions to you!

To answer your next question, I have no plans to cover the VIC in this column. My focus will remain on the CBM 8, 16 and 32K machines with 40-column screen.

A Speedy Story

Robert Maas, an Artificial Intelligence hacker I know, relates the following story:

"Several years ago, I became interested in the problem of how to cut a checkerboard into two identical halves. If the checkerboard has an odd number of squares on its edge, the center square is first removed. The problem had been solved for the 6 x 6 demonstration plot.)

The most important speedup trick was to make all constants variables as seen in Line 3110.

Line 20 prints the clear screen character which won't appear on my printer.

Santa Paravia and Fiumaccio

One of the "classic" computer games is Hammurabi—a simulation of a kingdom in old Sumeria in which you play the king. You plant grain, feed the peasants, buy and sell land and try to avoid famine, plague and revolution. If you are successful, the rats come to eat the grain, and the peasants are fruitful and multiply. To keep going, you must choose a middle course of occasional starvation and occasional well-being.

Santa Paravia and Fiumaccio is an extended version of Hammurabi set in the early Italian Renaissance. Your role is a petty ruler who wishes to become a king. Each round of play has four phases: agriculture and land deals, adjustment of taxation, display of your territory, and internal development and public works. As life is short, you have from 18 to 25 years in which to make your kingdom rich enough to become king.

The game can be played solo or with up to six players, with four levels of skill. So far, I haven't become king at the lowest level, so this game will take some time to master.

I like simulations of this sort, where success depends on a balance of things—much as success in business or one's career Kill'em games are not of much interest for they concentrate on the battle action, and not on the consequences of real life battles. If Space Invaders ever happened for real, it would be no joke (and would be all over within five minutes in the Invaders' favor.)

I did find the graphics in Santa Paravia annoying, particularly in the reports phases. Changing several of the PRINT AA$ to PRINT AB$ with AB$ set to a line of Shift-F removed a lot of the Shift-& (the little checkerboard halftone graphic) and made the reports more readable.

If I were to make more modifications I would change to a "balance sheet" style, as balance sheets are used by most businesses to tally their financial scores.

Santa Paravia comes from Instant Software in Peterborough, NH 03458. The cost is $9.95, catalog #0175P. You need at least 16K to run the program.

If you have a good simulation program, I'd like to see it. I feel that simulations will be the basis for most successful games in the future. □

A REMARKABLE MAGAZINE

creative computing

David Ahl, Founder and Publisher of Creative Computing

"The beat covered by Creative Computing is one of the most important, explosive and fast-changing."—Alvin Toffler

You might think the term "creative computing" is a contradiction. How can something as precise and logical as electronic computing possibly be creative? We think it can be. Consider the way computers are being used to create special effects in movies—image generation, coloring and computer-driven cameras and props. Or an electronic "sketchpad" for your home computer that adds animation, coloring and shading at your direction. How about a computer simulation of an invasion of killer bees with you trying to find a way of keeping them under control?

Beyond Our Dreams

Computers are not creative per se. But the way in which they are used can be highly creative and imaginative. Five years ago when *Creative Computing* magazine first billed itself as "The number 1 magazine of computer applications and software," we had no idea how far that idea would take us. Today, these applications are becoming so broad, so all-encompassing that the computer field will soon include virtually everything!

In light of this generality, we take "application" to mean whatever can be done with computers, *ought* to be done with computers or *might* be done with computers. That is the meat of *Creative Computing*.

Alvin Toffler, author of *Future Shock* and *The Third Wave* says, "I read *Creative Computing* not only for information about how to make the most of my own equipment but to keep an eye on how the whole field is emerging.

Creative Computing, the company as well as the magazine, is uniquely lighthearted but also seriously interested in all aspects of computing. Ours is the magazine of software, graphics, games and simulations for beginners and relaxing professionals. We try to present the new and important ideas of the field in a way that a 14-year old or a Cobol programmer can understand them. Things like text editing, social simulations, control of household devices, animation and graphics, and communications networks.

Understandable Yet Challenging

As the premier magazine for beginners, it is our solemn responsibility to make what we publish comprehensible to the newcomer. That does not mean easy; our readers like to be challenged. It means providing the reader who has no preparation with every possible means to seize the subject matter and make it his own.

However, we don't want the experts in our audience to be bored. So we try to publish articles of interest to beginners and experts at the same time. Ideally, we would like every piece to have instructional or informative content—and some depth—even when communicated humorously or playfully. Thus, our favorite kind of piece is acessible to the beginner, theoretically non-trivial, interesting on more than one level, and perhaps even humorous.

David Gerrold of *Star Trek* fame says, "*Creative Computing* with its unpretentious, down-to-earth lucidity encourages the computer user to have fun. *Creative Computing* makes it possible for me to learn basic programming skills and use the computer better than any other source.

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At *Creative Computing* we obtain new computer systems, peripherals, and software as soon as they are announced. We put them through their paces in our Software Development Center and also in the environment for which they are intended—home, business, laboratory, or school.

Our evaluations are unbiased and accurate. We compared word processing printers and found two losers among highly promoted makes. Conversely, we found one computer had far more than its advertised capability. Of 16 educational packages, only seven offered solid learning value.

When we say unbiased reviews we mean it. More than once, our honesty has cost us an advertiser—temporarily. But we feel that our first obligation is to our readers and that editorial excellence and integrity are our highest goals.

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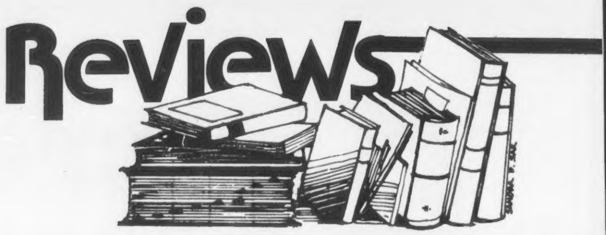

Steve Gray

Beginning Basic, by P.E. Gosling. Robotics Press. Box 10766, Portland, OR 97210. 110 pages, paperback $10.95. 1977.
Continuing Basic, by P.E. Gosling. Robotics Press. 146 pages, paperback $10.95. 1980.

These two books were originally published in England by Macmillan Press Ltd. and are part of the Macmillan "Basic Books in Electronics" series.

Both books were written for first-time users, defined by the author as perhaps being "school children using a computer terminal, technical college students, university undergraduates and commercial and industrial users."

Beginning Basic uses Data General's Basic for the Nova and Eclipse computers. The 14 chapters are on What is a Computer, Talking to a Computer, Introduction to Basic Teleprinter Algebra, Printing Literals, Conditional and Unconditional Jumps, Commas and Semicolons, FOR... NEXT...Loops, Lists and Arrays, Function Statements, REM Statements, Saving and Deletion Program, Using the Papertape Punch and reader, and Specimen Programs. A six-page appendix provides a summary of Basic.

After a couple of interesting programs to show what can be done on a computer, Gosling starts with a four-line program and takes seven pages explaining it and modifying it slightly. At all times he tells the reader exactly what to expect in interactive operations, and uses many callouts to explain program printouts, mainly in the first chapters, where they're needed most.

The author then proceeds, after laying a firm base, to add to it with short programs that expand on previous programs, most of them only half a dozen lines long. RUNs are provided for nearly all programs, in legible Teletype output.

The last chapter provides 16 mathematical and statistical programs as examples of how programs should be written, and also as being "of general use to students who are learning programming."

Continuing Basic continues "from where *Beginning Basic* left off, although it is perfectly possible for a student with an elementary knowledge of the Basic language to use the book on its own," as the preface puts it.

The book is in two parts. Part I, with three chapters, on Design of Algorithms, Subroutines, and Flowcharting Exercises, "formalizes an approach to designing computer programs by dealing with the construction of algorithms," and is totally language-independent.

Part II starts with the first third of the summary of Basic that ends the earlier book, and offers five chapters on Some Additional Features of Basic, Strings, Matrix Manipulation, Subroutines, and Files. The book ends with a dozen programming exercises, seven assorted programs that "illustrate a number of uses of the Basic language," and answers to the flowcharting exercises.

The programs in Part II are written in Data General Basic and Hewlett-Packard Basic. A new ribbon should have been used on the HP printer.

Part I can be read with profit by anyone interested in learning the basics of flowcharting. It is simply written, nicely detailed, and could scarcely be improved upon.

Part II uses flowcharts to illustrate various points, and gets into much longer programs than the earlier book, but builds up to them adequately.

The two books make an excellent introduction to Basic.

Practical Basic Programs, edited by Lon Poole. Osborne/McGrawHill, Berkeley, CA. 179 pages, paperback $15.99. 1980.

This is a follow-on to a previous Osborne book, *Some Common Basic Programs*, and contains 40 Basic "financial, mathematical, scientific and management decision-making programs people use all the time," according to the back cover.

All the time? Perhaps someone in a financial position might make frequent use of programs such as Current Value of a Treasury Bill or Present Value of a Tax Deduction, but who would be using Markov Analysis or Lagrangian Interpolation all the time?

To be fair, some of these 40 programs might be used frequently by some, including Checkbook Reconciliation, Home Budgeting and maybe even Music Transposition. But this book is best suited to those who never know when they'll be called upon to provide a Basic program for something like Syndicated Investment Analysis, Nonlinear Breakeven Analysis, Data Forecasting Divergence, or Economic Order Quantity.

The programs are all well documented, with a description, sample RUN, practice problems, and a Basic listing.

As for the brand of Basic used, the various writers have "adopted programming conventions that would allow the programs in this book to run unmodified on as many versions of Basic as we could. In some cases we could not do this. String variables, string functions, and string operators are treated too differently in some versions of Basic. Wherever we could anticipate such compatibility problems, we identified them in the appendix and suggest alternatives there as well," according to the introduction.

The appendix contains suggestions on how to resolve Basic problems, and is a nice finishing touch to a well-produced book of not-so-common programs.

Microcomputers for External Control Devices, by James A. Gupton Jr. Dilithium Press, 30 NW 23 Pl., Portland, OR 97210. 285 pages, paperback $13.95.

The back cover says "Can you use a microcomputer to control devices in your home, business or elsewhere? This book will show you how....This guidebook for controlling mechanical or process operations with a microcomputer covers everything from the most basic control functions to mechanized robot controls."

Not quite. There's very little "how to" in this book, and it's confined to a couple of chapters. You're told how to calibrate a Datel unipolar D/A converter (one page), how to program Dynabyte's Basic Controller (11 pages, half of which is photographs), and basic theory of how the Gimix system works (9 pages, half photos) and how the Summagraphics Bit Pad operates (6 pages).

The rest of the book is a catalog of various products, heavily larded with photos and schematics, perhaps of interest if you have a good technical background, but of very little interest if you don't.

The chapters are on the principles of data acquisition and conversion, remote control, microprocessors, programmable controllers, Computer Systems for Automating Your Home, control-related interfaces, process control, robots, and Control Design Prototype Development.

That last chapter sounds good, but actually it tells where to get breadboarding items, not how to develop prototype controls. The rest of the book is pretty much like that, full of material apparently taken from catalogs and spec sheets.

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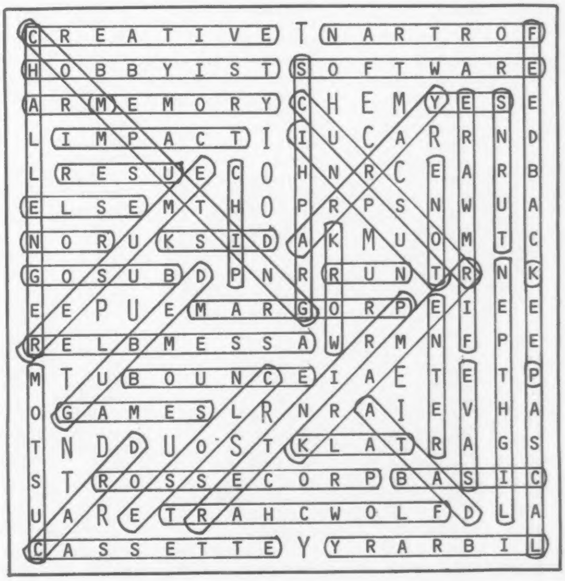
Answer: The Microcomputer Industry



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The story behind the two best selling computer games books in the world.

Computer Games

by David H. Ahl

Everybody likes games. Children like tic tac toe. Gamblers like blackjack. Trekkies like Star Trek. Almost everyone has a favorite game or two.

It Started in 1971

Ten years ago when I was at Digital Equipment Corp. (DEC), we wanted a painless way to show reluctant educators that computers weren't scary or difficult to use. Games and simulations seemed like a good method.

So I put out a call to all our customers to send us their best computer games. The response was overwhelming. I got 21 versions of blackjack, 15 of nim and 12 of battleship.

From this enormous outpouring I selected the 90 best games and added 11 that I had written myself for a total of 101. I edited these into a book called 101 Basic Computer Games which was published by DEC. It still is.

When I left DEC in 1974 I asked for the rights to print the book independently. They agreed as long as the name was changed.

Converted to Microsoft Basic

The games in the original book were in many different dialects of Basic. So Steve North and I converted all the games to standard Microsoft Basic, expanded the descriptions and published the book under the new name Basic Computer Games.

Over the next three years, people sent in improved versions of many of the games along with scores of new ones. So in 1979, we totally revised and corrected Basic Computer Games and published a completely new companion volume of 84 additional games called More Basic Computer Games. This edition is available in both Microsoft Basic and TRS-80 Basic for owners of the TRS-80 computer.

Today Basic Computer Games is in its fifth printing and More Basic Computer Games is in its second. Combined sales are over one half million copies making them the best selling pair of books in recreational computing by a wide margin. There are many imitators, but all offer a fraction of the number of games and cost far more.

The games in these books include classic board games like checkers. They include challenging simulation games like Camel (get across the desert on your camel) and Super Star Trek. There are number games like Guess My Number, Stars and Battle of Numbers. You'll find gambling games like blackjack, keno, and poker. All told there are 185 different games in these two books.

Whether you're just getting started with computers or a proficient programmer, you'll find something of interest. You'll find 15-line games and 400-line games and everything in between.

The value offered by these books is outstanding. Every other publisher has raised the price of their books yet these sell for the same price as they did in 1974.

Moneyback Guarantee

Examine one or both of these books and key some games into your computer. If you're not completely satisfied we'll refund the full purchase price plus your return postage.

Basic Computer Games costs only $7.50 and More Basic Computer Games just $7.95 for either the Microsoft or TRS-80 edition (please specify your choice on your order). Both books together are $15. Send payment plus $2.00 shipping and handling to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders should include card number and expiration date. Charge card orders may also be called in toll-free to 800-631-8112 (in NJ 201-540-0445).

Order today to turn your computer into the best game player on the block.

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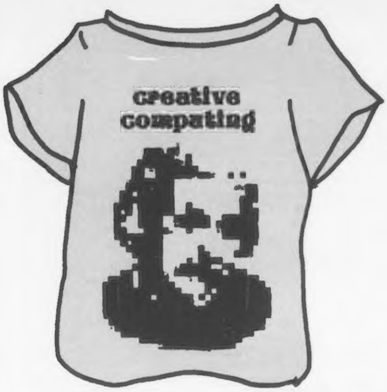
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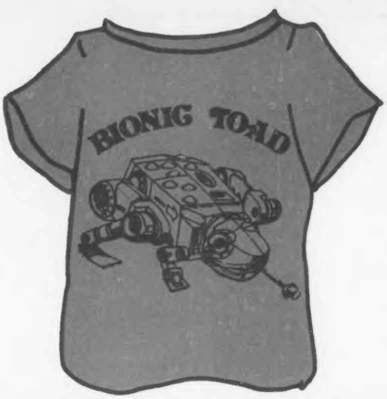
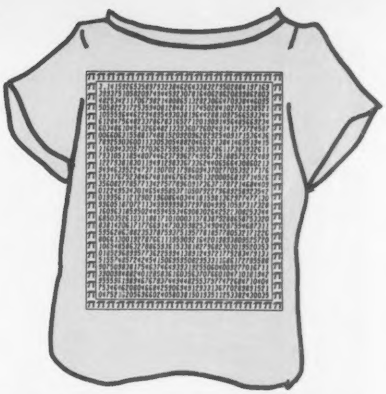
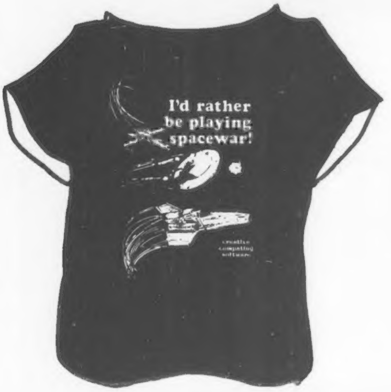
Creative Computing-- Albert Einstein in black on a red denim-look shirt with red neckband and cuffs.


BIONIC TOAD

Creative's own outrageous **Bionic Toad** in dark blue on a light blue shirt for kids and adults.



Plotter display of **Pi to 1362 Places** in dark brown on a tan shirt.

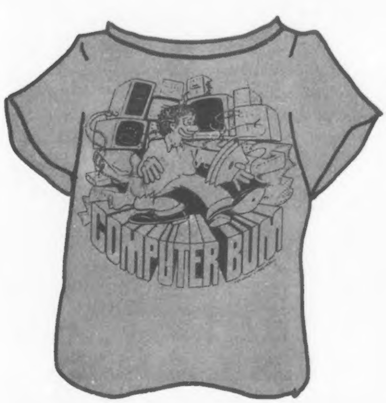

I'd rather be playing spacewar!
creative computing software

I'd rather be playing spacewar-- black with white spaceships and lettering.

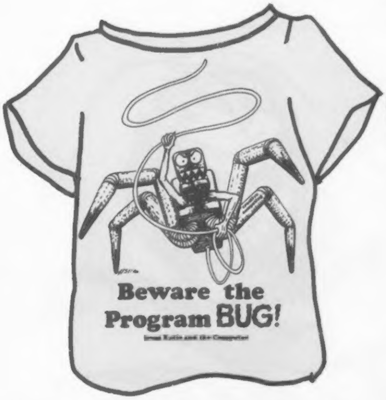
Give your tie a rest!

All T-shirts are available in adult sizes S,M,L,XL. Bionic Toad, Program Bug and Spacewar also available in children's sizes S (6-8), M (10-12) and L (14-16). Made in USA. $6.00 each postpaid.

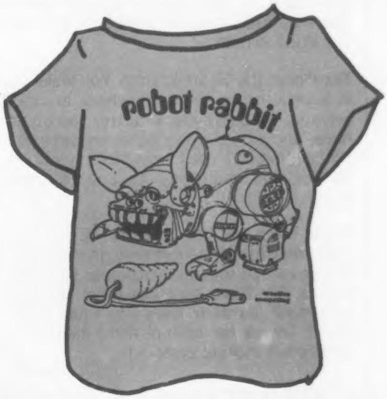
Specify design and size and send $6.00 for each shirt to Creative Computing, P.O. Box 789-M, Morristown, NJ 07960. Orders for two or more shirts may be charged to Visa, MasterCard or American Express. Save time and call toll-free **800-631-8112** (in NJ 201-540-0445).


COMPUTER BUM

Computer Bum-- black design by cartoonist Monte Wolverton on gray denim-look skirt with black neckband and cuffs.


Beware the Program BUG!

The **Program Bug** that terrorized Cybernia in Katie and the Computer is back on this beige t-shirt with purple design. You can share the little monster with your favorite kid.


robot rabbit

Roll down the block with this little black **Robot Rabbit** (on a bright orange t-shirt) on your back and you can intimidate every carrot, radish or cuke in your way.

CIRCLE 300 ON READER SERVICE CARD

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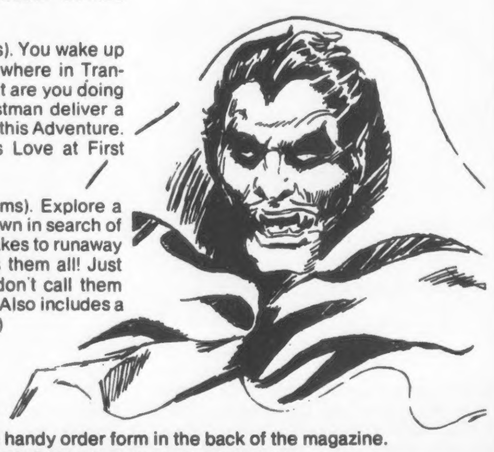

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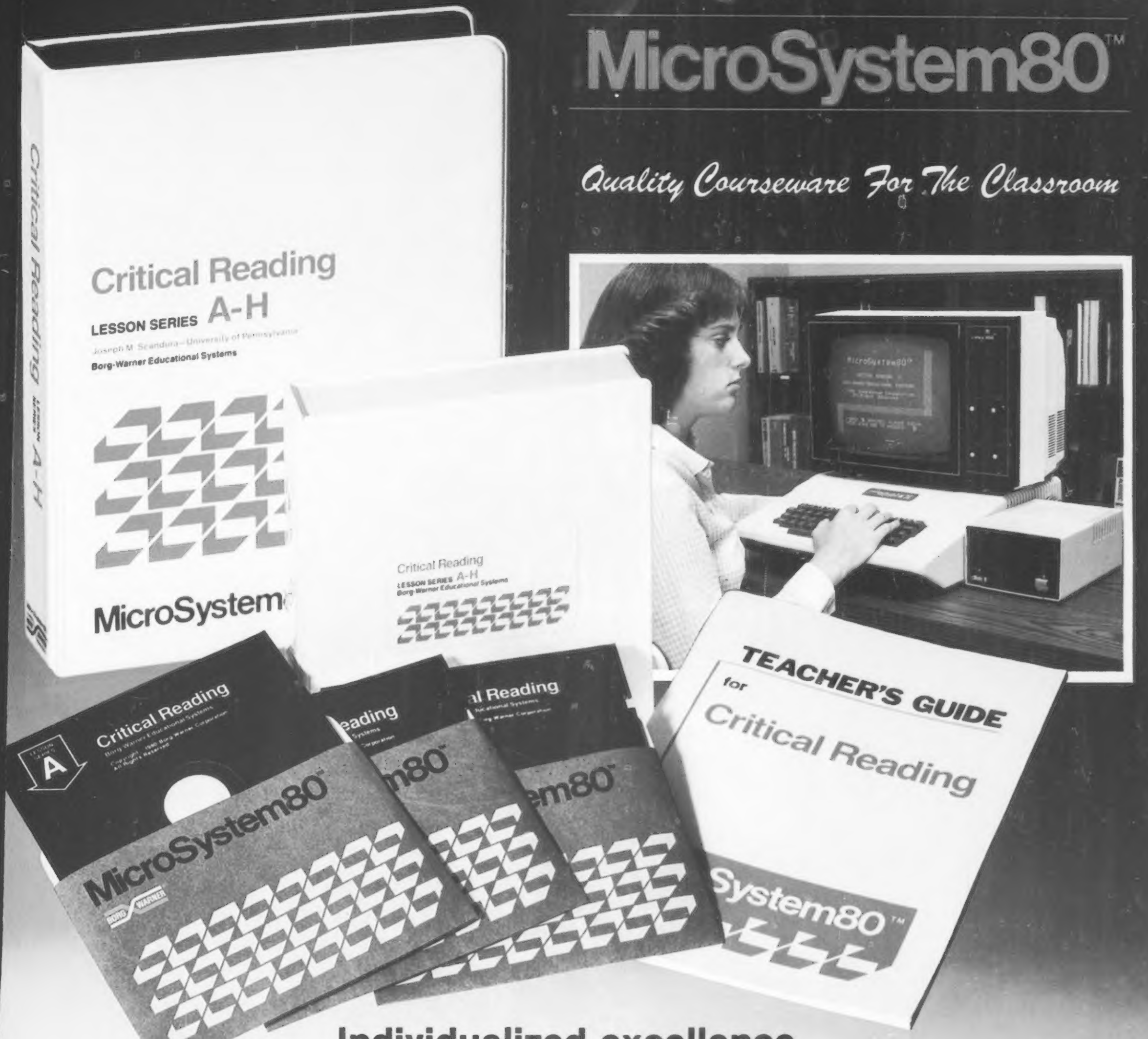
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